Welding Engineer

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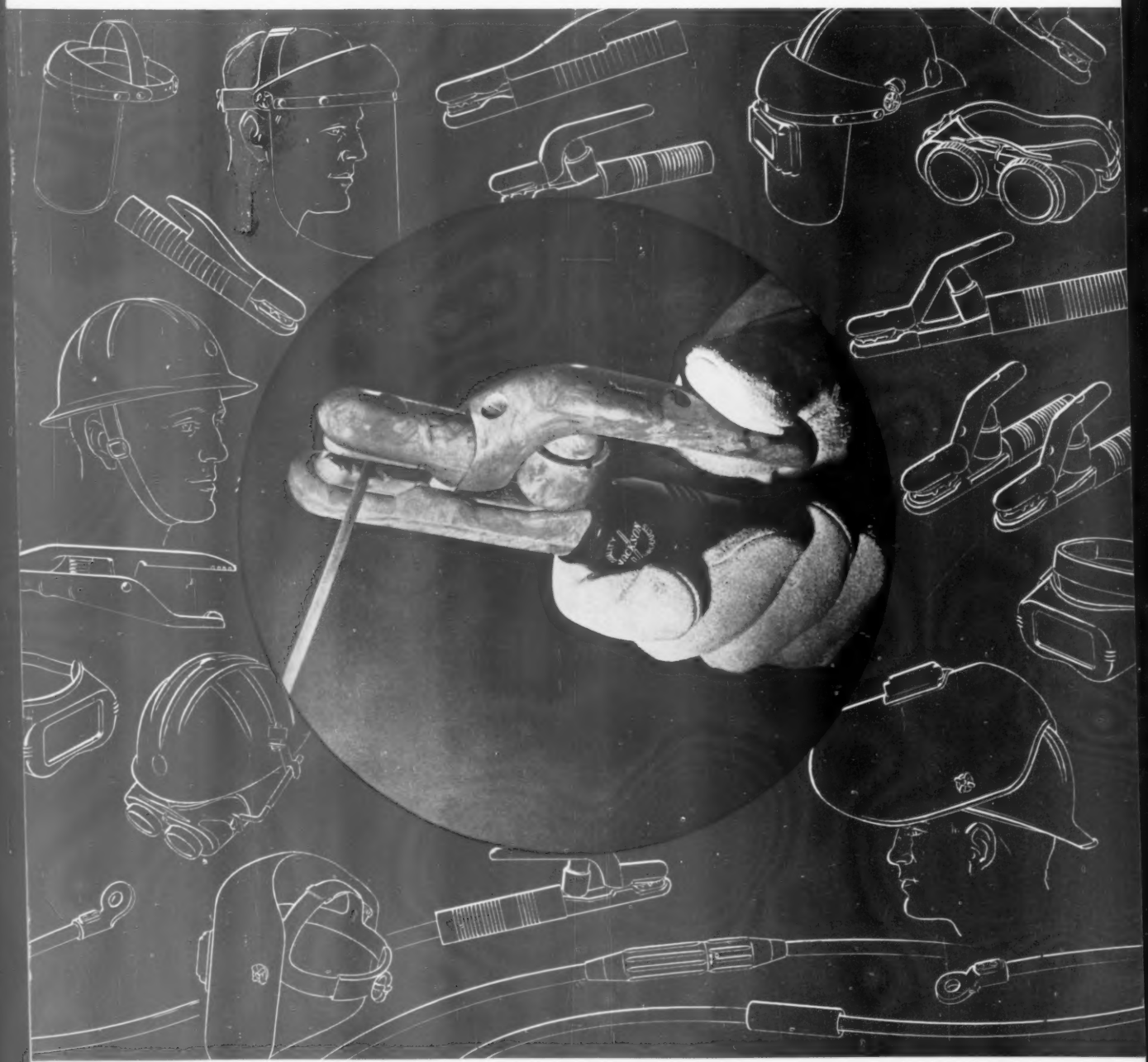
DECEMBER, 1957



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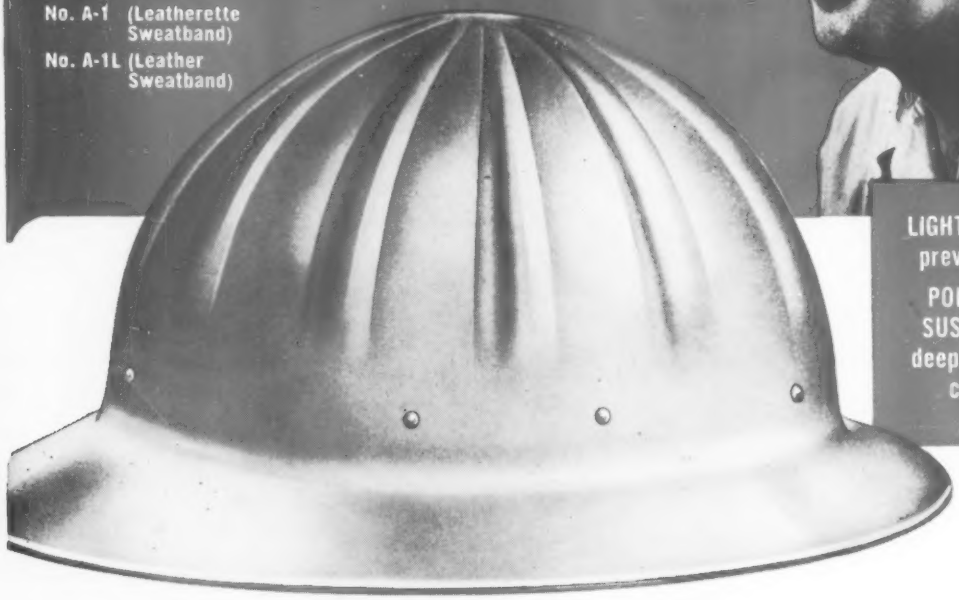

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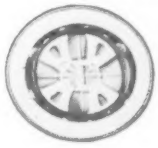

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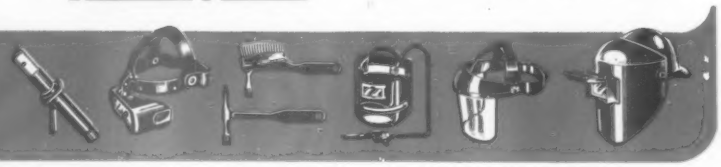

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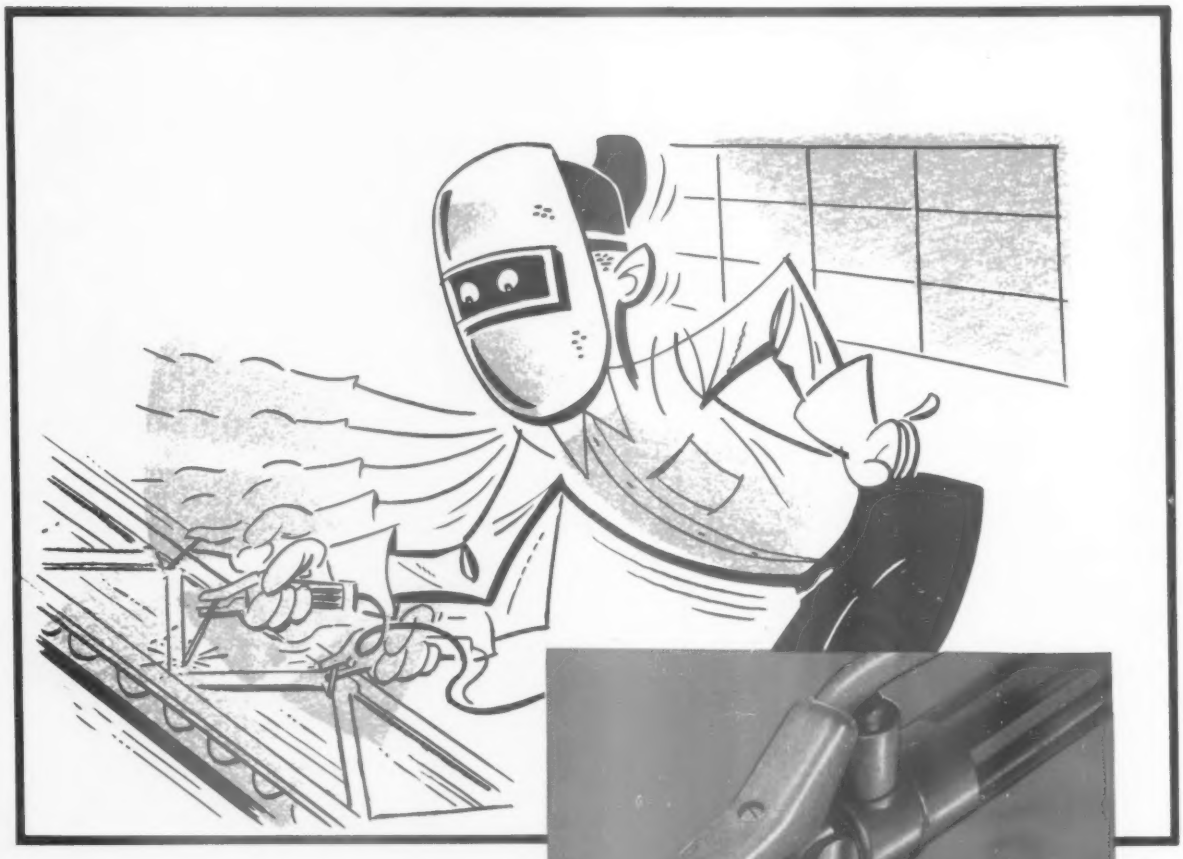

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Welding Engineer

DECEMBER, 1957
VOL. 42—No. 12

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's Pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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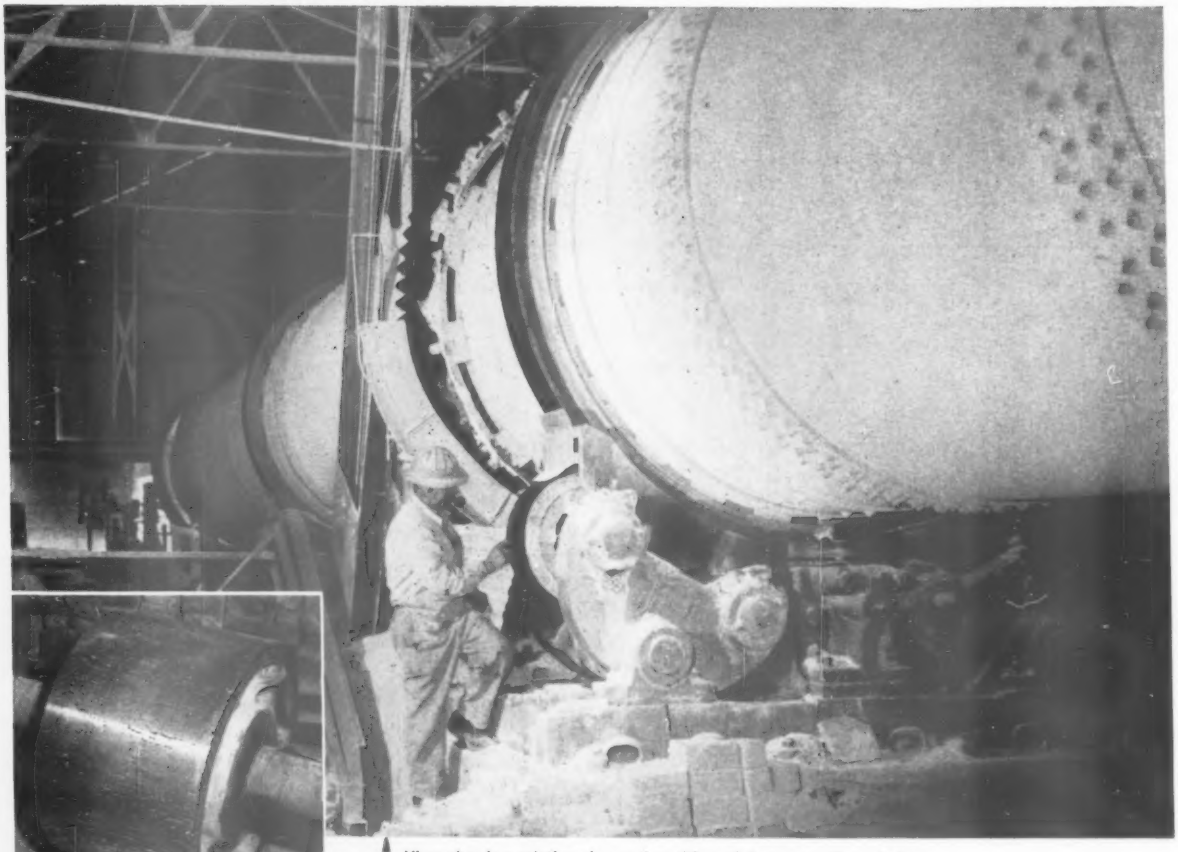

View showing relative size and position of furnace, rolls and rings.

Roll hardfaced with Victoralloy No. 1. After ten months of constant operation, no wear, flaking, or cracking of edges.

A case of wear and tear... and how Victoralloy solved it

PROBLEM:

The 300-ton furnace of Diamond Springs Lime Company, Diamond Springs, Calif., rolls on 16 centered 30/40 carbon steel rolls. The furnace's heavy weight and terrific heat caused the rolls to flake and crack at the edges. This in turn caused the furnace roller-rings to begin disintegrating. How to stop the wear and tear before an expensive shutdown and complete replacement of rolls and roller-rings became necessary?

SOLUTION:

Herbert Green, superintendent, and John Desson, general foreman, hardfaced the rolls with Victoralloy No. 1 Coated-Electric. Checking after ten months of operation, they found the case solved: no flaking of rolls, no cracking at the edges, and no disintegration of furnace roller-rings.

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ABOVE: Army's new mobile liquid oxygen plant can operate anywhere to produce liquid oxygen for fueling guided missiles.
RIGHT: Miss Tennessee of 1957, Amanda Whitman, models Linde Coronation necklace for Adger S. Johnson, president of National Carbon Co., and William M. Haile, Linde Co. president. (See stories below.)

News

Liquid oxygen speeds missiles

To help power guided missiles through space, the Army and Air Products, Inc., Allentown, Pa., have developed a mobile, million-dollar battlefront industrial plant to turn out liquid oxygen.

The enormous amounts of energy needed to push the missiles through space is provided by a fuel burned by a super oxidizer—liquid oxygen. Twenty tons a day of the cold, blue liquid are turned out by the new portable plant. More on this next month.

Spooled wire wrapped in plastic yet!

The plastic bag craze has hit the welding wire industry.

Ampco Metal, Inc., is packaging its spools or rims of bare wire in clear plastic bags before shipping them in fiberboard containers. The plastic wrappers keep the wire clean, and are long enough to be reused if the spools are stored between jobs.

Taylor-Winfield buys Struthers-Wells lines

Metal-forming and work-handling machinery formerly built by Struthers-Wells Corp., Titusville, Pa., will now be manufactured exclusively by Taylor-Winfield Corp., Warren, Ohio. The purchase enables Taylor-Winfield to design and build coordinated production lines to process coil or strip through to the finished welded product. The Warren firm will also manufacture individual metal-forming machines and will provide repair, redesign and replacement service for metal-forming and work-handling equipment previously manufactured by Struthers-Wells.

With the new facilities, Taylor-Winfield can manufacture tangent benders, folding machines, brake presses and other custom-designed equipment.

Key management, engineering and manufacturing personnel of Struthers-Wells have joined Taylor-Winfield. "One manufacturer will now be responsible for an entire production line," says T. S. Long, vice president and general manager of Taylor-Winfield.

Phoenix names winners in farm weld contest

Ralph Wong of Marana, Ariz., won first prize in Phoenix Welding Supply Co.'s annual high school farm welding contest. At the State Future Farmers meeting, Gil V. Dye, Jr., president of the Phoenix, Ariz., firm, presented Ralph with a Hobart 180 amp a-c welder. Ralph's winning entry was a welded water trailer.

Second award went to Pat Franklin of Douglas, Ariz., for his construction of a horse trailer. Pat received a Smith pipeline welding outfit and a set of Dye Oxygen Co. welding cylinders. A $100 assortment of Stoody hardfacing rods went to third-place winner Dennis Harman of Yuma, Ariz. His entry was a fertilizer spreader.

Nashville greets new arrival

Liquid oxygen's arrival in Nashville, Tenn., was celebrated with a reception and Welderama. More than 200 leading citizens turned out to meet William M. Haile, president of Linde Co., Adger S. Johnson, president of National Carbon Co., and other Union Carbide Corp. officials.

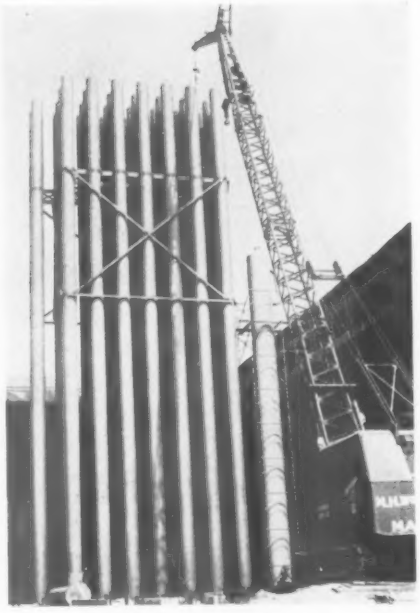
Linde products and processes were exhibited at the reception and Amanda Whitman, Miss Tennessee of 1957, modeled the Linde Coronation necklace.

A two-day Welderama at the Price-Bass Co. featured demonstrations of a variety of welding and cutting processes and color movies on phases of welding.

Ornamental Iron men gather in Memphis

The second national Ornamental Iron Manufacturers' convention will be held Jan. 23, 24 and 25 in Memphis, Tenn. Convention-goers will see actual demonstrations in the shops of Tennessee Fabricating Co. Display space is available to manufacturers of shop and welding equipment of interest to ornamental iron firms. Contact Lee McLean, care of Tennessee Fabricating Co., 1490 Grimes St., Memphis.

GATHERED around the table are members of the AWS Educational Activities Committee. From left to right, they are: William J. Williams, W. G. Leaman, Arthur L. Phillips, Clarence E. Jackson, T. Embury Jones, George G. Luther and H. A. Sosnin. (See story below.)



RIGHT: Newcomers to the steel industry, these 80-ft high oxygen storage tubes hold a total of 125,000 cu ft of oxygen. The vertical tubes were built by Air Products, Inc. for Granite City Steel Co., Granite City, Ill. (See story below.)

Must boost welding warns EAC

Lack of information on opportunities in welding is keeping many persons out of the field, surmised the Educational Activities Committee of the American Welding Society at a meeting held recently at Scranton, Pa. Potential workers are unaware of the possibilities of welding as a career, the committee claimed. The EAC is the coordinating committee for all AWS educational committees.

"Youth is being influenced by literature which glamorizes other industries," stated Clarence E. Jackson, chairman of EAC, "and the AWS must compete with such literature." He was assigned to work with W. J. Williams, director of the school of shop practices, International Correspondence School, on the format of a brochure to be called, "Opportunities in the welding industry."

Claude Michael opens California branch

Claude Michael Agency, soldering material specialists in Glendale, Calif., recently opened a branch office in Palo Alto, Calif. E. T. James, sales representative, is in charge of the new office.

Linde expands Tonawanda labs

More new facilities for Linde Co.'s Tonawanda Research laboratories will include a high-pressure laboratory, metallurgical lab, a new hydrocarbon storage building and a new services building. Equipment capable of producing gas and liquid pressures up to 200,000 psi will be in a new high-pressure lab; in a metallurgical laboratory new equipment to develop welding procedures on various metals will be available. This lab will also include a special room for X-raying metals, a darkroom, preparation room and metallography room for micrography to determine grain structures of metal.

Longer, lower autos bring welding problems

Lowering automobile silhouettes brings engineers face-to-face with the problem of putting more structure into less space. Steel predominates as the ideal building material, says L. M. Forbush, a member of General Motors Engineering staff. Three materials which might be used to reduce passenger car body weight—aluminum, magnesium or titanium—are only ⅓, 1/5 or little better than half as stiff as steel. Also, these alloys present new problems in welding or joining techniques which raise costs, Forbush declared.

U.S. Steel switches division operation

According to Clifford F. Hood, president of U. S. Steel Corp., the firm's Gerrard Steel Strapping Div. will operate as part of U. S. Steel Supply Div. The move was made to simplify organization structure, and to provide improved service, Hood said.

Oxygen tanks rise sky-high

Towering 80 ft above the ground at Granite City Steel Co., Granite City, Ill., are 30 vertical pressurized oxygen storage tubes, newcomers in the steel industry. Installed by Air Products, Inc., Allentown, Pa., the storage bank holds 125,000 standard cu ft of 99.5% purity oxygen, providing Granite City with reserve oxygen for peak periods.

Stored under 450 psi pressure, the high-purity oxygen is generated at the steel company's new 60,000,000 cu ft per month oxygen generator, leased from Air Products. The vertical 80-ft tubes are "firsts" in the steel industry. Until this time, storage tubes have been installed horizontally, Air Products reports. The upright position requires only a fraction of the space a flat bank would occupy.

Machine design winners named by Lincoln

Tom Learmont, product engineer for Bucyrus Erie Co., Milwaukee, cinched the $5,000 first award in The James F. Lincoln Arc Welding Foundation's machine design competition. Learmont's winning design was the welded steel base of a 55 cu yd power shovel weighing 452,000 lb. Welding saved 22% in weight, 15% on material costs with a net manufacturing savings of 24%. The cost of stripping coal with the new shovel is reduced about 20%. The national competition sponsored by the Cleveland Foundation emphasized the de-

(Continued on page 98)

The Seeler Universal Resuscitator can be operated even where oxygen is not available . . .

Firemen are called upon, at any hour of the day or night, to rescue life and to protect property. Ebbing life needs instant action . . .

The Seeler Universal Resuscitator was designed and developed by Henry Seeler at the Wright-Patterson Air Force Base. It received the Thurman H. Bane award by the Institute of Aeronautical Sciences. This wonderful rescue unit is built by the Medical and Hospital Division of Globe Industries, Inc. And . . . because only the very best and most reliable pressure regulators assure the dependable function of this splendid unit, GLOBE INDUSTRIES, INC. selected the regulators made by NATIONAL of California. Here is a resuscitator . . . inhalator . . . aspirator which offers the greatest versatility ever known for life saving equipment. And, we are very proud that the discerning engineers of GLOBE INDUSTRIES MEDICAL and HOSPITAL DIVISION, after careful testing of available regulators on the market, selected those made by our company. Here, again, is our outstanding reason why YOU, TOO, will be served best and most economically if YOU, TOO, place your confidence in the fine regulators made by our company for every cylinder gas . . . for very low or exceedingly high delivery pressures, for small or very large hourly gas consumption, for cylinders or cylinder manifold use.

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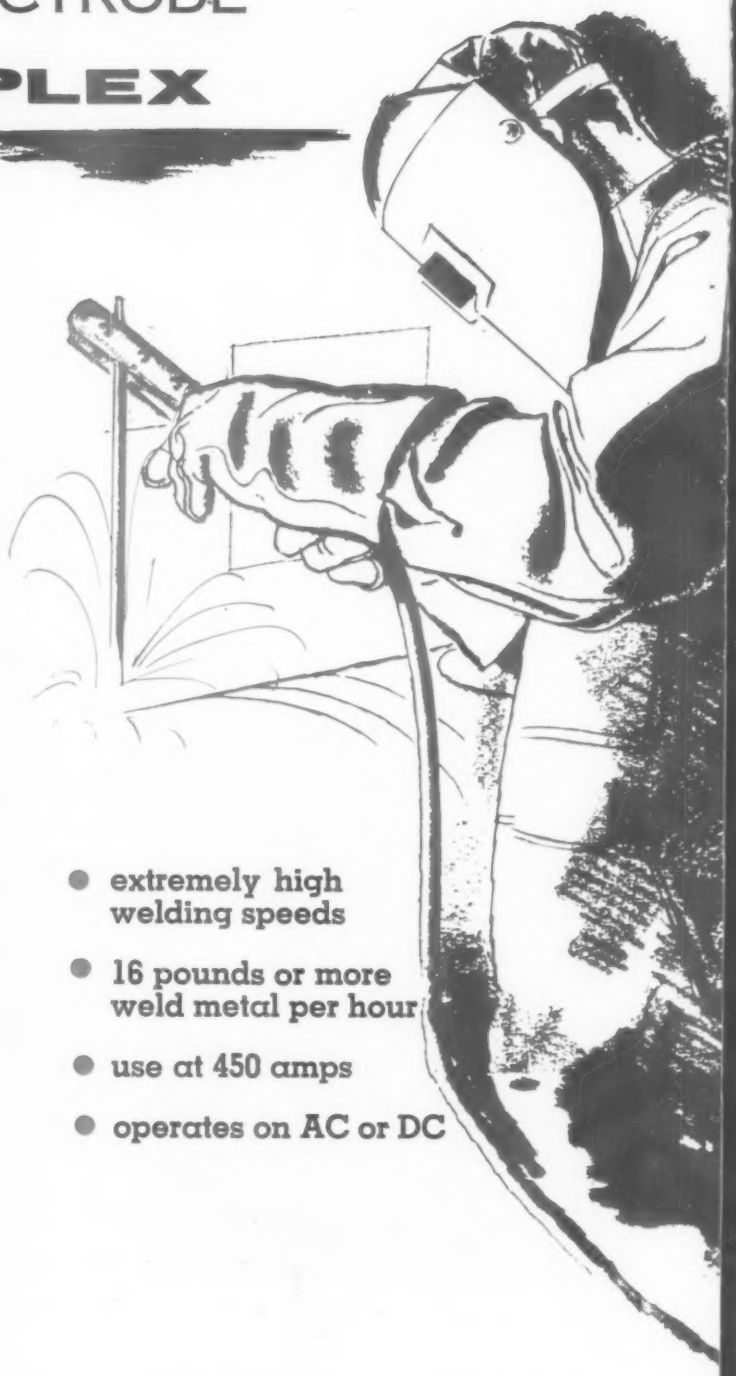
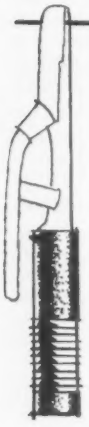


SPEEDEX TRIPLEX is a heavily loaded iron powder electrode which offers extremely high manual welding speeds approaching those of automatic equipment. Designed for downhand welding with either drag or open arc technique, this new electrode will deposit 16 pounds or more of weld metal per hour. Speedex Triplex is specifically designed for downhand welding of large fabrications such as ship sections, freight cars and tanks. Available in 1/4" diameter only, the electrode is used at currents as high as 450 amps. Using the drag technique 3/8" positioned fillets may be made while 1/2" fillets may be produced with open arc. Triplex operates equally well with AC or DC, has good arc characteristics and an easily removed slag. Welds produced have ultimate strengths of 62,000 to 66,000 psi combined with excellent elongations of from 30 to 33 percent.

- extremely high welding speeds
- 16 pounds or more weld metal per hour
- use at 450 amps
- operates on AC or DC



Other M&T Iron Powder Electrodes:

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Speedex	U	E-6013 I-P
Speedex		E-6024
Speedex	HTS	E-7016 I-P
Speedex	LH	E-7016 I-P

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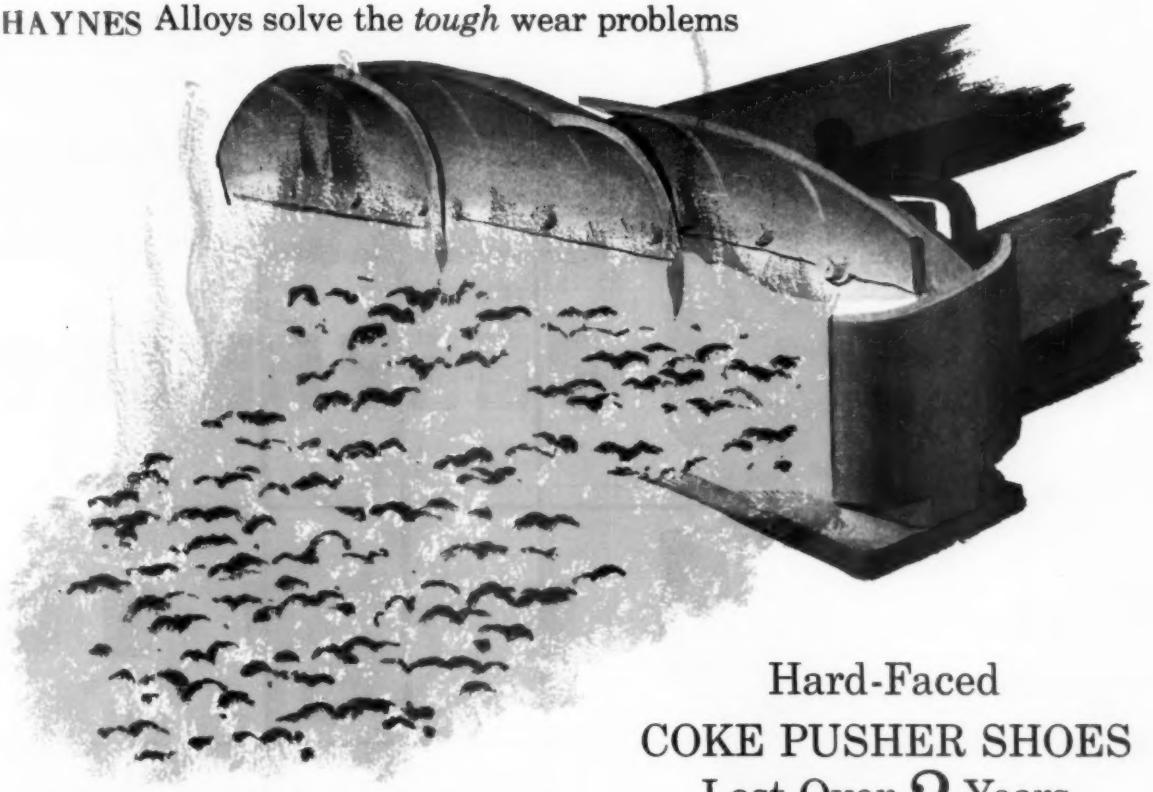
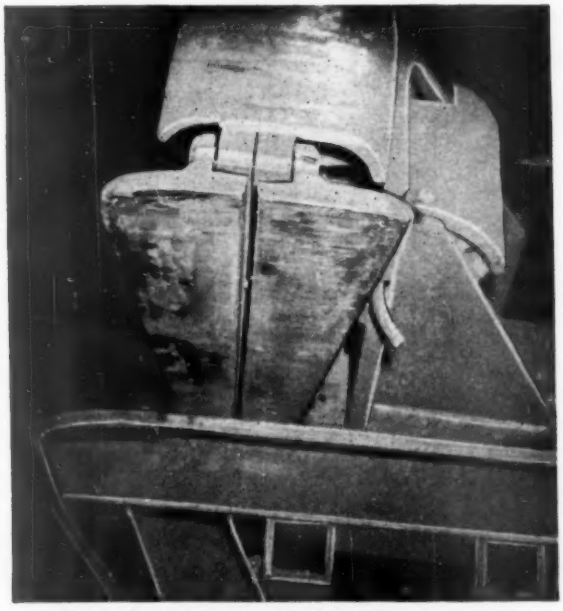


Hard-Faced COKE PUSHER SHOES Last Over 2 Years



These shoes, hard-faced with HAYNES STELLITE alloy No. 1, resist abrasion from the coke particles and the lining of the oven floor. The hard-faced deposit does not chip or spall under the thermal shock of returning from 1800 deg. F., in the oven, to ordinary atmospheric temperatures.

Resisting severe abrasion, heat, and thermal shock produced by riding over the coke-covered floor of 1800-deg. F. ovens—these shoes hard-faced with HAYNES STELLITE alloy No. 1 lasted over two years. Ordinary steel shoes wore out in two months.

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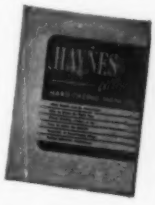

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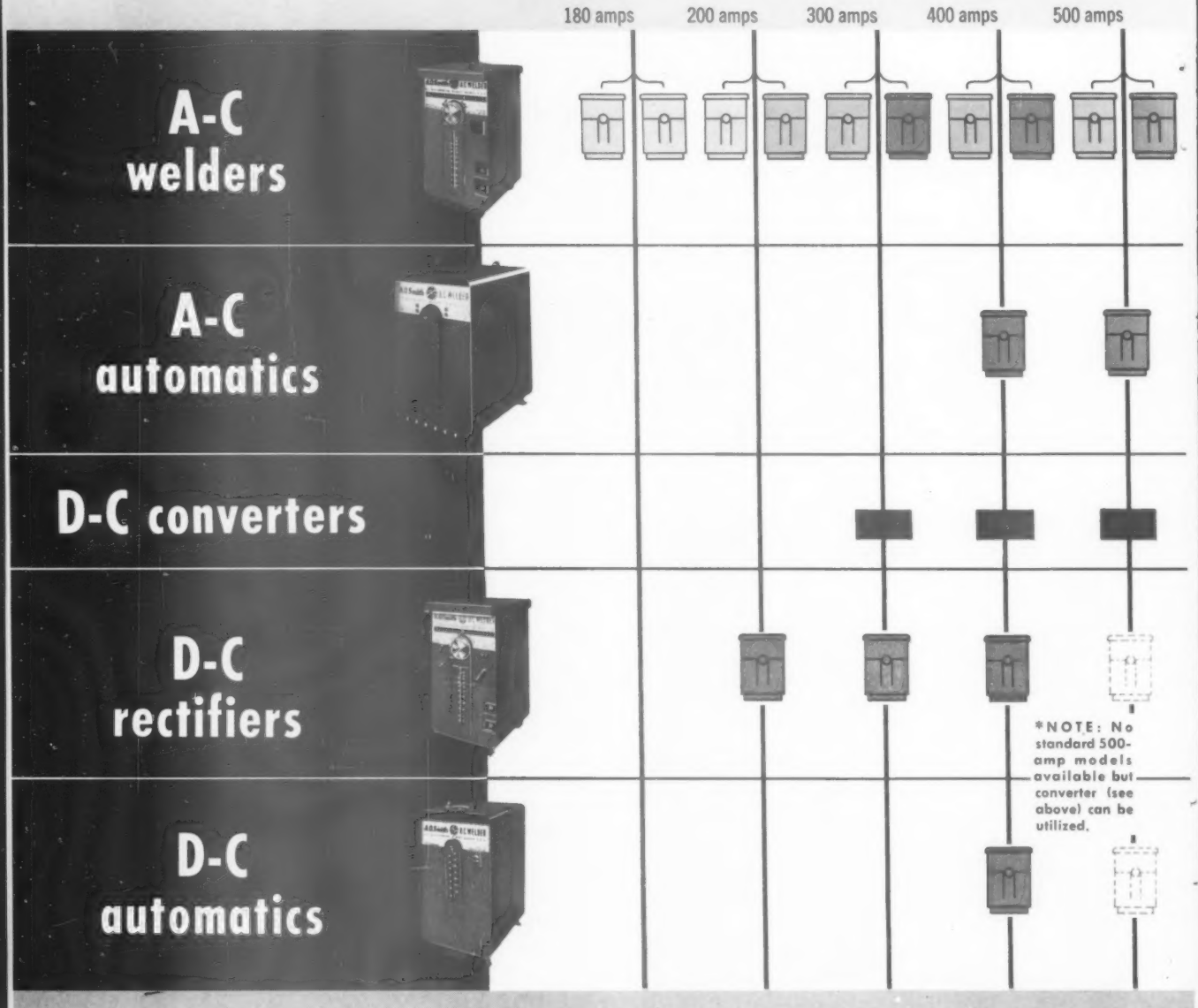
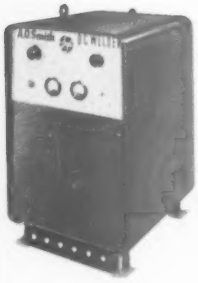


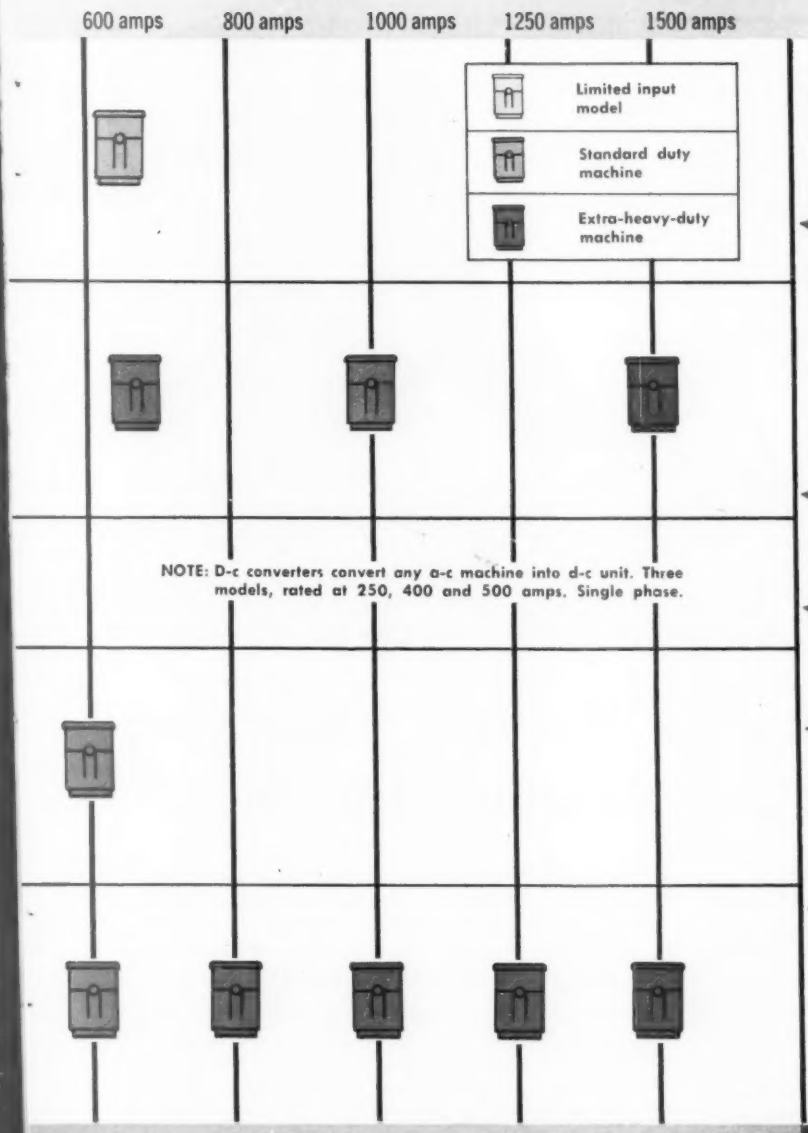
200-amp d-c gas drive — weighs approximately 400 lbs. Handles all electrodes from 1/16 to 5/32 straight or reverse polarity. Can be used as auxiliary a-c power source for lights, power tools, etc.



600 and 1500 constant potentials — 600 amp unit—0 to 45 open circuit volts with fast, easy and precise voltage control. Larger unit offers 80 open circuit volts... handles 10 to 16 welders with grids.

it on the line!

of welding machines


600 amps
800 amps
1000 amps
1250 amps
1500 amps
Limited input model
Standard duty machine
Extra-heavy-duty machine
NOTE: D-c converters convert any a-c machine into d-c unit. Three models, rated at 250, 400 and 500 amps. Single phase.

Limited input models—for farm, shop, maintenance and light-duty repair service — U-180, 180-amp welder and battery charger with dual welding range . . . U-18, same as preceding without battery charger . . . and Model "20S" dual-rated shop welder . . . 200 amps at 50% duty cycle, 295 amps at 20% duty cycle.

"Standard" NEMA a-c welders—Famed A. O. Smith Challenger models in 200, 300, 400, 500 and 650 amp ratings. Last model can be hooked up in series or in parallel. All models except 650-amp unit offer 75 open circuit volts — 650 is rated at 80 open circuit volts.

Extra-heavy-duty a-c welders—This is the elite line of a-c welders, capable of withstanding rough duty that makes other welders fail. All offer full 75 open circuit volts and many other plus features.

A-c automatics — Five basic models . . . 400, 500, 650, 1000 and 1500 amperes. Standard models include primary line contactors. Available with or without automatic/remote current control.

D-c converters — small compact packages quickly and simply convert *any* a-c machine to a d-c unit. Three models — 250, 400 and 500 amps — make *any* machine in your shop a dual welder. A-c or d-c — whatever the job requires.

D-c rectifiers — Here's the most complete line of d-c machines in the industry. All the advantages of m-g sets with none of the maintenance and parts replacement disadvantages. 80 full open circuit volts. Four choices of arc characteristics.

D-c automatics — 6 standard models covering the 400- to 1500-amp range. All feature 80 open circuit volts for more precise arc control regardless of the type of work. Like all A. O. Smith welding machines, they're qualify built in every detail . . . are easy to set up, regulate and work with. Primary line contactor is standard. Automatic/remote current control is optional.

Get the complete story on these A. O. Smith machines by contacting your "man from A. O. Smith" or write direct.

C-OMATIC — A. O. Smith's exclusive CO_2 automatic welding process. CO_2 costs only a fraction of helium or argon . . . can save thousands of dollars annually on gas costs alone. Easily set up, easy to use. Includes control console, remote-control stand, automatic head and special A. O. Smith 600-amp d-c rectifier.

C-OMANUAL — Recently introduced CO_2 hand gun version of C-OMATIC (above) puts manual welding on a virtual mass-production basis. Includes lightweight hand gun which automatically compensates for arc length . . . portable control console and special A. O. Smith d-c rectifier.

Through research . . . *a better way*

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

A. O. Smith International S. A.,
Milwaukee 1, Wisconsin, U. S. A.

▶ Get Mallory Standard Welding Electrodes From Your Mallory Welding Distributor

When you're looking for ways to cut costs in resistance welding, call on your nearby Mallory Welding Distributor. He carries the most complete line of standard resistance welding electrodes ever offered. And he can help you select standard, delivered-from-stock electrodes for many fabricating jobs for which you may have been using expensive, custom-made tooling.

In the Mallory line are fluted and round hole Elkaloy®-A and Mallory-3® electrodes in all three standard Morse taper shanks . . . dome, flat and center-insert Elkonite®-faced electrodes...5 types of socket electrodes . . . flat and centered male and female threaded Elkonite-faced electrodes with Elkonite shanks . . . and 24 types of irregular electrodes of various dimensions and tapers.

The complete line is described in Mallory's new catalog of standard resistance welding electrodes. Ask your Mallory Welding Distributor for your copy. If you are not yet acquainted with a Mallory Distributor, write Mallory for the name and address of the one serving your area.

OVER 30 YEARS OF RESISTANCE WELDING LEADERSHIP

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

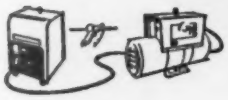
DECEMBER
1957

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.



. . Air Reduction Sales Co. is supplementing its retail outlets in the welding supply field. It recently purchased Arcway Equipment Co., Philadelphia, and Welding Sales & Engineering Co., Detroit. Airco also acquired General Electric's former direct sales outlet in Tulsa, Okla.

. . A wire-feed unit and gun for semiautomatic open-arc hardfacing is now being offered by Alloy Rods Co., York, Pa. It's the firm's first venture into the equipment field.

. . Crucible Steel Co. of America is now sole owner of Rem-Cru Titanium, Inc. It purchased half interest owned by Remington Arms Co. with 150,000 shares of Crucible common stock.

. . Metal show, held in Chicago last month, stressed automation, but not much welding. Few among the 500-or-so exhibitors were from our industry.

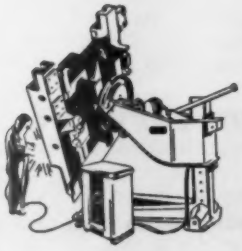
. . Uranium welding, subject of a paper at the AIME sessions, is described on page 72 of this issue. Tig method was found best for fusion welding of radioactive element.

. . Eutectic Welding Alloys Corp. on Nov. 8 opened new manufacturing and service facilities in Mexico City.

. . Space welding is new concept in construction of metal sandwiches, says Linde Co. Removable spacers enable sheets to be separated during welding, using regular Mig spot welding gun. Arc melts hole in one sheet; flowing metal fuses with second sheet; filler wire is then fed into joint, filling hole and fusing top sheet.

. . Plans for a West Coast acetylene gas plant have been revealed by Liquid Carbonic Corp., Chicago, now a part of General Dynamics. New Fresno, Calif., site will also include production facilities for carbon dioxide and oxygen.

. . NWSA's businss condition report shows third quarter sales running 6% above similar period last year. First nine months of 1957 are running 7% better than in 1956.



. . Above is reflected in nine-month financial reports of several welding equipment manufacturers. Air Reducton Sales and Metal & Thermit, for example, report record sales. Airco was up 13.8% in that period, M&T 8%.

Aluminum Welding Cable

Makes Your Job Easier!

Saves Effort!

Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 *Aluminum* Welding Cable is available in all standard sizes from General Cable.

General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast

30 YEARS AGO

(Taken from *The Welding Engineer* of December, 1927)

22 years old, but still growing, headlines an ad. Prest-O-Lite dissolved acetylene has been used in greater volume year after year for 22 years. Today you can obtain Prest-O-Lite for oxy-acetylene welding and cutting from 119 plants and warehouses.

—30 YEARS AGO—

The nation's strength is the nation's health. Buy Christmas Seals and help preserve it.

—30 YEARS AGO—

Twenty years ago, starts an editorial, a blacksmith with his helper and a foreman constituted the entire population of Corwith Yards of the Sante Fe System in Chicago. A small shanty and a remodeled box car were the only buildings. Today the plant covers fifteen acres, has a two-story office building; blacksmith, tin, welding, valve, bolt, hose and brass shops; two rolling mills; a store house and requires 650 employees.

—30 YEARS AGO—

You can't make angel cake from corn meal, and you can't use baling wire for the best welded joints, an Oxweld Acetylene Co. ad declares.

—30 YEARS AGO—

There would be more welding of pipe in industrial plants if those who planned buildings knew more about these advantages.

—30 YEARS AGO—

The outlook for 1928 is, on the whole, favorable. Economic conditions are sound . . . earnings of labor have never been so high and with a continuance of good business their earnings should continue, says Gerard Swope, president of General Electric Co.

—30 YEARS AGO—

According to reports in the new model of Ford car over 400 parts will be welded—an increase of practically 100% over the previous model.

—30 YEARS AGO—

The Welding Engineering and Construction Co., a new firm of consulting welding engineers, have opened offices in Cleveland and Chicago.

BERNARD

"Shortstub"

ELECTRODE HOLDERS

NOW EQUIPPED WITH

CABLE SPLINT

ENDS CABLE FRAYING

"SHORTSTUB" equipped with "CABLE-SPLINT" completely and efficiently eliminates cable fraying. Minimizes cable waste, maintenance, and operator down time due to overheated holders.

"CABLE-SPLINT" is a standard feature on all "SHORTSTUB" holders at no additional cost.

Don't wait! Write for further information on this and many other exclusive features that make "SHORTSTUB" the recognized standard for modern high current, high speed welding.

PIONEER FOR BERNARD MODERN WELDING

WELDING EQUIPMENT CO.

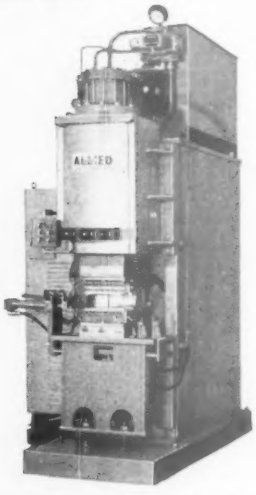
10232 S. AVENUE N
CHICAGO 17, ILLINOIS

Since you're looking for better tools . . .

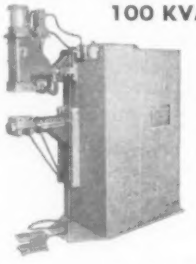
. . . LET'S TALK STANDARD WELDERS!

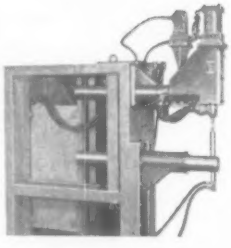
Allied's new roller head press type combination spot and projection welder (lower illustrations) has 8 outstanding advantages. Standard models are approximately one foot less in width than conventional welders, accomplished by placing arms off-center with controls installed within chassis frame where protected. Arms can be installed left or right of center making possible convenient welding of irregular-shaped pieces that fit naturally around corner of machine. Machines with right and left hand mounted arms may be installed adjacent to each other and within 9½" for sequence welding. Arms may be extended by simply loosening 3 screws on casting to give up to 30" throat depth. Vertical adjustment of lower arm up to 15" is provided without changing current characteristics except on air gap since transformer is connected directly to arm support casting instead of mounting plate. By removing 4 bolts, head may be replaced with special adaptations such as multiple guns or projection welding platens. This is done in minutes on the job. Welders are completely water cooled with open or closed circuits. Available in standard sizes: 30, 50 and 75 KVA with 1000 P.S.I. at 80 lbs. line pressure and 75, 100 and 150 KVA with 2300 P.S.I. at 80 lbs. line pressure and on up to 750 KVA in press welders (top). Prices are well below that of conventional welders of equal capacity.

750 KVA



100 KVA

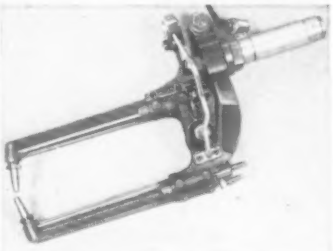


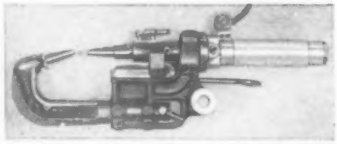


Write for information.

. . . LET'S TALK WELDING GUNS!

Operation so cool you can hold your hand on the jaw extension right below the point is main feature of this new line of portable guns. Incoming water reaches point through tube insulated almost its entire length from metal of jaw by return water jacket which has 5 times capacity of in-flow tube. Heat transfer to the in-flow tube is much less than with small diameter cast-in return water tubes that build up excessive heat in the jaw extension. Use contact fulcrum pin in place of conventional shunt which tends to overheat causing early failure Built-in guide for moving jaw prevents wear on fulcrum pin if gun is used in cocked position. Line includes "C" and scissors type with upper or lower jaw operating and types for special applications. Guns have been on heavy duty production test for 2 years.





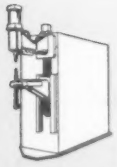
YOUR SPECIAL EQUIPMENT PROBLEM — *HOW BIG IS IT . . . REALLY?*

If it involves special equipment for a production welding operation it may not be a problem at all—just an assignment when placed in competent hands.

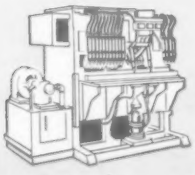
This is our kind of work—we specialize in it—do it every day; designing and building special machines for welding everything from bathtubs to trailers, frequently including provisions for automatic handling and transfer where the job is a part of a production line set-up.

We're no brain trust here at Allied Welder, but we keep some awfully important production people happy with our creative designing and manufacturing know-how—delivery, too.

May we work with you on your next job?



Standard Welders



Special Welders

Automation Equipment

Automatic Arc Welders

Welding Guns

ALLIED WELDER CORPORATION
8700 BRANDT DEARBORN, MICHIGAN

Creative Design

Letters should be addressed to: The Editor, WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested.

X-ray protection

Califon, N. J.

Dear Sir:

On page 60 of your August issue we notice a statement under "Industrial X-ray protection" about a dental film packet with lead filters.

To keep your data on X-ray protection up-to-date, our film badge service is based on official AEC and NBS requirements. The Oak Ridge type badge holder employs cadmium filters which enable us to distinguish between X-rays and gamma radiation, if the wearer has been exposed to both.

Generally speaking, industrial X-ray protection is best achieved by observing the following rules: 1) Have an industrial radiologist design and install your equipment. 2) Have your personnel trained by an expert. 3) Use all necessary safeguards called for by your State Code, AEC and NBS rules and specifications.

Herbert R. Isenburger
St. John X-Ray Laboratory

Welding education

Appleton, Wis.

Dear Sir:

Your editorial in the October issue of WELDING ENGINEER is a fine article on education in welding. It is certainly gratifying to me to see that we have at least one man calling attention to the necessity of more information and more courses in our schools.

Welding is the fastest growing industry in the country today. Why its advancement and education is dependent entirely on the manufacturers and users, and they will not teach it successfully in schools, I do not know. I am sure more editorials from people like you may get the job done.

Niels C. Miller
Miller Mfg. Co.

Tough! as they come

ATLAS TOMAHAWKS

Biggest sellers in the Atlas line—All-steel

"Rebit" replaceable bit Tomahawks with steel handles

"Dual Tools" Tomahawk and brush with and without replaceable bit

One of a big selection of Atlas wood handle Tomahawks

Atlas quality in low cost all-steel Tomahawks

Ask your welding supply dealer to show you the Atlas line

They ask us: WHY 30 MODELS?

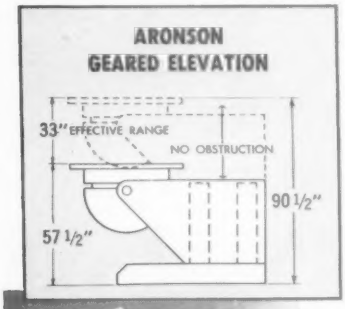
We Answer:

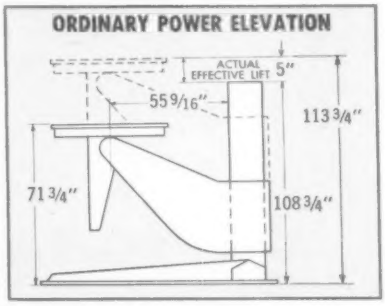
—because weld cleaning jobs offer such a wide variety of problems—because welders have strong preferences for certain tool styles. Atlas has made a sincere effort to provide you with the tool you want regardless of your likes and dislikes, in ATLAS QUALITY!

ATLAS WELDING ACCESSORIES INC.
1707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

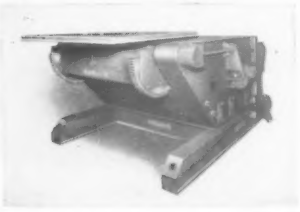
Aronson GEARED ELEVATION Versus Ordinary Power Elevation

The best working position is as near the floor as possible. The only reason to elevate the work on the positioner is to give floor clearance for extra large work pieces.





In the ordinary positioner the workpiece can be no bigger than 9'-3" in diameter if it is to clear the single post sticking up the back.
This means that the single-post design requires large work to be loaded on the table in the flat position when the table is at least 108 3/4" (over NINE FEET high!) above the floor.
At that height, there is only FIVE INCHES additional height range!
With ARONSON "Geared Elevation" there is no limit to the diameter of work that can be loaded on the table in the flat position when the table is at its minimum height of 57 1/2" (LESS THAN FIVE FEET high!). And then you still have THIRTY-THREE Inches of Powered Elevation to use as you need it.



POSITIONEERING with Aronson

UNIVERSAL BALANCE® POSITIONERS
BENCH TURNTABLE POSITIONERS
GEAR DRIVEN POSITIONERS
HEADSTOCK-TAILSTOCK POSITIONERS
TRACTRED® TURNING ROLLS
RUBBER-TIRED TURNING ROLLS
RAIL CAR POSITIONERS • TURNTABLES
FULLY AUTOMATIC POSITIONERS
MAGNETIC WELDING CLAMPS

ARONSON offers you over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact requirements

Write for detailed engineering data

Quality POSITIONERS by **Aronson MACHINE COMPANY**
ARCADE, NEW YORK

AWS spec change

Chicago

Dear Sir:

Since my article "Filler metals for joining" aluminum and aluminum alloys appeared in the October issue of WELDING ENGINEER, there has been a change in AWS Specification A5.10-57T, covering aluminum and aluminum alloy welding rods and bare electrodes.

In general, we think you will find that changes made by the AWS-ASMT Committee are in pretty good agreement with information given in the article. The American Welding Society has adopted Aluminum Association numbers in many cases and also has used their new designation, ER, which stands for electrodes and welding rods of bare wire suitable for welding with inert-gas-shielded processes.

The AWS is to be congratulated on up-dating a specification that was only three years old, and they have been extremely helpful in keeping their filler metal specifications in tune with commercial practices. We trust that this will explain why there may be some minor differences between the article we have written and the recently-issued revised specification.

Orville T. Barnett
Armour Research Foundation of
Illinois Institute of Technology

Master weldor?

Baltimore

Dear Sir:

Someone recently told me of a weldor who had a "Master Weldor's" certificate. Do you know of any state that issues such a certificate? I have also heard of a weldor who can weld two overhead butt welds at the same time, one with the right hand and one with the left. If anyone should know if this feat is possible, it's WELDING ENGINEER.

Frank E. Schmidtmann

—So far as we know, there is no Master Weldor certificate. It would be possible for a weldor to make two welds at the same time, but such a stunt is not likely to become popular—too tiring.

Bouquets to . . .

Los Angeles

Dear Sir:

Congratulations on the fine work you are doing with your WELDING ENGINEER. We wish you continued success in its publication.

R. J. Mastick
Norris-Thermador Corp.

USS TECHNICAL WELDING DATA

5

Welding Tests on USS "T-1" Steel

Reported here are the results of underbead cracking tests made on ½" plates of USS "T-1" Steel. Details of test specimens are shown in Fig. 1. Welds were made at an initial temperature of 70°F. using E-6010 and low hydrogen electrodes.

Results of cracking tests are shown in the table at right. Note that in the specimens welded with E-6010 electrodes a great amount of cracking occurs. However, the specimens welded with low hydrogen electrodes show little or no underbead cracking. It is suggested, therefore, that only low-hydrogen-type electrodes be used for the welding of "T-1" Steel.

A hardness survey of an underbead-cracking specimen welded with an E-12015 electrode is shown in Fig. 2. Note that the peak hardness obtained at the immediate junction of weld metal to parent metal is about 420 DPH. This hardness is unaffected by changes in type of electrode.

Table showing susceptibility of ½-inch thick "T-1" Steel to underbead cracking (Heat 74L236)

Per Cent of Underbead Cracking*			
Initial Plate Temp., °F	E-6010 (Cellulose Type)	E-12015 (Low Hydrogen Type)	E-9015 (Low Hydrogen Type)
0	23	3	0
70	54	1	0

Average of five tests

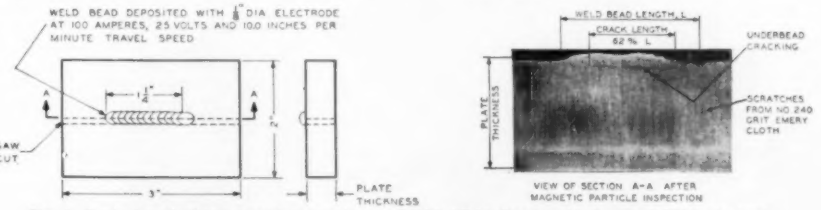

WELD BEAD DEPOSITED WITH 1/8" DIA ELECTRODE AT 100 AMPERES, 25 VOLTS AND 10.0 INCHES PER MINUTE TRAVEL SPEED
1 1/4"
A
A
SAW CUT
3"
PLATE THICKNESS
WELD BEAD LENGTH, L
CRACK LENGTH, 62 % L
UNDERBEAD CRACKING
PLATE THICKNESS
SCRATCHES FROM NO. 240 GRIT EMERY CLOTH
VIEW OF SECTION A-A AFTER MAGNETIC PARTICLE INSPECTION

Fig. 1. Typical underbead cracking specimen of USS "T-1" Steel welded with E-6010 electrode.

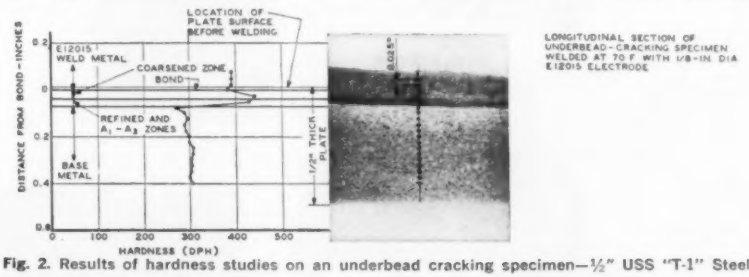


Fig. 2. Results of hardness studies on an underbead cracking specimen—½" USS "T-1" Steel.

REMEMBER THIS: No other alloy steel offers the combination of properties that "T-1" Steel possesses. Here, in just one steel, you get very high yield strength (90,000 psi minimum), extraordinary toughness, great resistance to impact abrasion, and good high temperature strength. These let you reduce the size of highly stressed parts . . . save weight, reduce the amount of welding required and cut your costs. USS "T-1" Steel is being used in bridges, excavating equipment, pressure vessels, towers . . . in equipment that must take heavy abuse in sub-freezing temperatures . . . in equipment that must withstand heavy stresses and impact abrasion at temperatures up to 900°F.

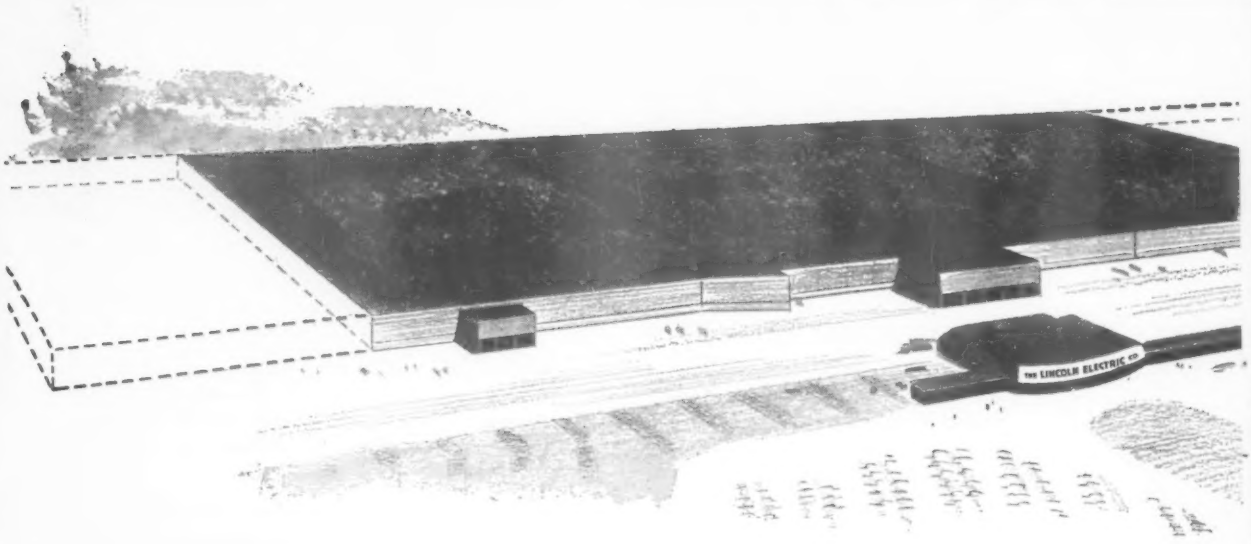
WRITE FOR COMPLETE INFORMATION about the application and fabrication of USS "T-1" Steel. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

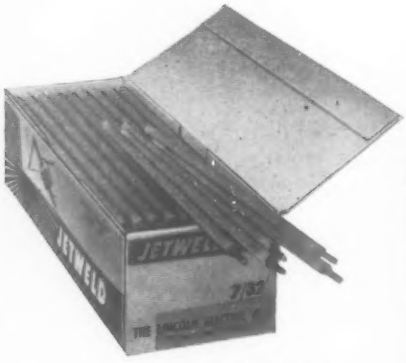
USS and "T-1" are registered trademarks.

United States Steel Corporation, Pittsburgh • Columbia-Geneva Steel Division, San Francisco • Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division, Warehouse Distributors, Coast-to-Coast • United States Steel Export Company, New York

UNITED STATES STEEL



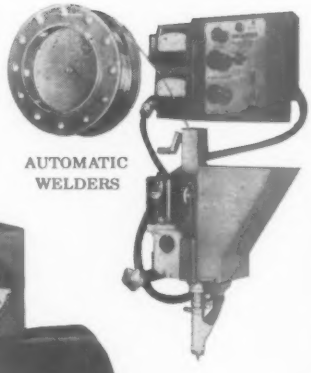
Lincoln's 60% plant expansion
makes it now, even more, the... **RELIABLE**



ELECTRODES

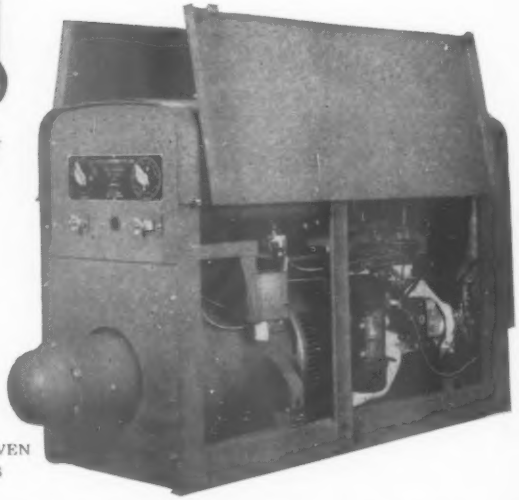
TRANSFORMER-RECTIFIER WELDERS

SEMI-AUTOMATIC WELDERS



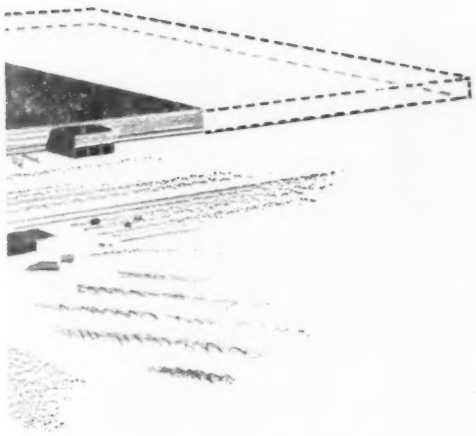
AUTOMATIC WELDERS

MOTOR-GENERATOR WELDERS



ENGINE-DRIVEN WELDERS

The World's Largest Manufacturer of Arc Welding Equipment



For over 50 years Lincoln's sole purpose has been to provide the arc welding industry with a complete line of top quality products . . . at the lowest possible cost.

SINGLE SOURCE SUPPLY

for all your Arc Welding needs

Today, in spite of rising prices, Lincoln equipment and products while maintaining high standards of quality, cost less than 30 years ago.

The Lincoln line includes transformer-rectifier, motor-generator, engine driven and automatic and semi-automatic welders in capacities to suit the needs of the home craftsman or the largest industry.

Lincoln has been first with cost cutting advances in arc welding electrodes. Iron powder electrodes that cut welding time as much as 30% were a Lincoln first. Lincoln Fleetweld 5, the most outstanding of all mild steel electrodes when first developed, is still an all time favorite. Lincoln research continues to improve existing electrodes and develop new electrodes as new applications arise.

New 60% expansion of Lincoln's still young (5 year old) plant assures industry of a supply line that won't run dry.

To help you apply these products to best advantage Lincoln maintains the largest and best trained welding sales force in the country. Lincoln welding engineers maintain offices in 54 cities throughout the United States and are only hours away from any welding problem.

30 warehouses, strategically located across the country, assure rapid delivery of Lincoln products.

No orphans, Lincoln machines are serviced in 220 field service shops by factory trained mechanics with genuine Lincoln parts. And Lincoln's factory rebuild program offers complete reconditioning of any welder regardless of age and condition at a fraction of replacement cost.

Lincoln can bring you superior products and better service at less cost because welding is our primary business—not a sideline.

Bulletins on any type of arc welding equipment and electrodes are available. Write—

LINCOLN

THE LINCOLN ELECTRIC COMPANY

Dept. 1736 • Cleveland 17, Ohio

PICK THE RIGHT DISC-WHEEL FOR EACH JOB

BLUE FLASH®

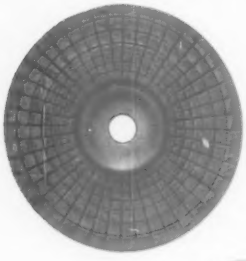
Specify BLUE FLASH for fast, sharp grinding action with high stock-removal speed and low grinding costs.

SAF-T-CUT BZ

Specify SAF-T-CUT BZ for jobs which tear away the wheel surface, as in jagged, thin, or hard metal edges.

BAYFLEX®

Specify BAYFLEX for smooth, easily controlled cutting action in light fabrication. Resists loading on soft metals.



DURACUT®

Specify DURACUT for light to medium stock removal in blending and finishing broad areas, flat or curved.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. In Canada: Bay State Abrasive Products Co. Ltd., Brantford, Ontario. *Distributors:* All principal cities.

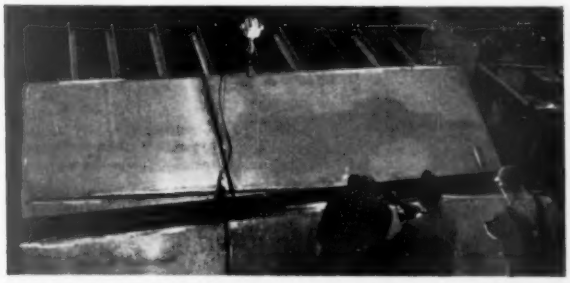
Inert gas and "60" Monel wire help Peterson[1] move full speed ahead on Monel tanks for Navy

Peterson's layout men start by placing 5/32 inch and 1/4 inch Monel* nickel-copper alloy tank components on wooden patterns. During layout, plates are tack welded to prevent slippage.

After shearing, workers lightly grind edges to assure cleanliness . . . then reassemble and retack top plates as before, using the inert gas shielded tungsten arc method with 1/16 inch or 1/8 inch "60" Monel* wire.

Weldors finish-weld top plates using 1/16 inch "60" Monel wire and Aircomatic[2] gun mounted on converted plate cutting machine. Then they tack frames to plate. Despite large number of welds, plates develop little warpage.

For rigidity of assembly to permit rotating tank for subsequent welding, swash plates go in next. With "60" Monel wire this operation moves fast. There's no need for flux or slag removal.



Crane rotates tank for position welding of side plates and finish-welding of frames. End plates, manhole flanges and piping are installed. Then the tank goes to testing.

Pressure tests show welds are strong. Because tanks are for minesweepers, Navy specs call for 10-pound oil test on fuel tanks and a 5-pound test on water tanks.

Inco's "Sixty" series of filler wires are your best bet for predictable high quality welding of high nickel alloys.

For complete information, write for "Inco Welding Materials." Booklet discusses products, gives pertinent data on selection and use.

*Registered trademark

(1) Peterson Builders Inc., Sturgeon Bay, Wis.
(2) Registered trademark, Air Reduction Sales Company, Inc.

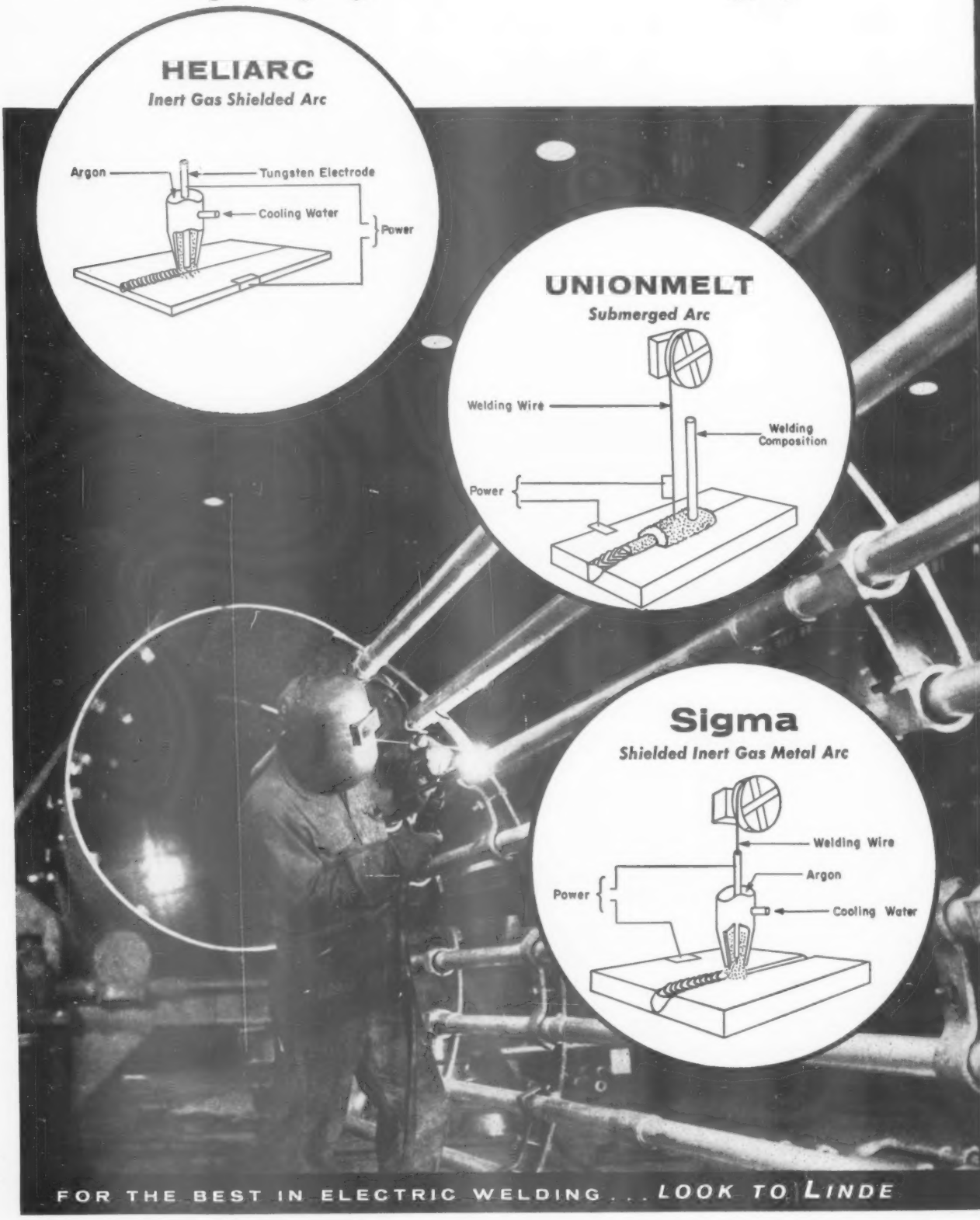
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

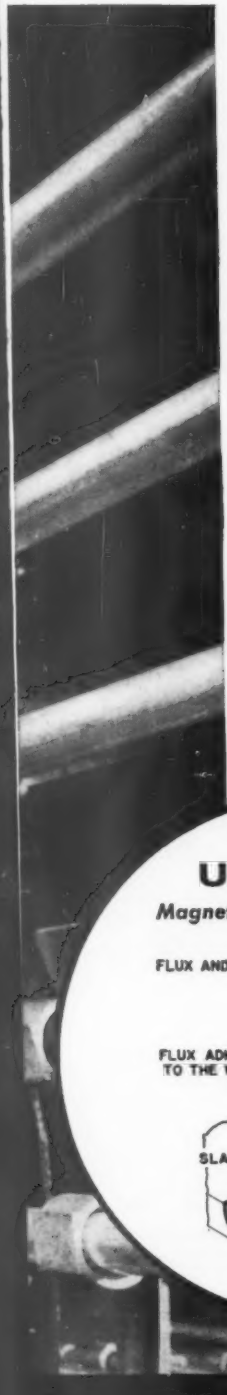
INCO WELDING PRODUCTS

Electrodes • Wires • Fluxes

For any of your welding jobs



. . . LINDE can supply the *right method!*



Inert gas shielded arc welding—

HELIARC Apparatus for inert gas shielded arc welding, using a tungsten electrode and a shield of LINDE argon, is tops for joining hard-to-weld commercial metals. On stainless steel and aluminum, HELIARC Welding is fast and clean, producing high-quality welds that resist corrosion. HELIARC Welding eliminates costly grinding and finishing, making it a valuable method for quantity production of hard-to-weld metals.

Submerged arc welding—

Shapes made of materials ranging from light gage to heavy plate, adaptable to mechanization, can be most economically joined by UNIONMELT Welding. It is used on low and medium carbon steels and alloy steels, including those containing chrome and/or nickel. UNIONMELT Welding is also used extensively for resurfacing metal, providing extra wear and corrosion resistance. UNIONMELT Welding is fast and inexpensive on production jobs.

Shielded inert gas metal arc welding—

One of the most versatile welding methods is Sigma Welding. LINDE's Sigma apparatus, using a shield of LINDE argon, is ideal for manual welding of commercial metals $\frac{1}{8}$ in. or more thick, and for automatic operation on lighter gage metals to .050 in. Highest quality welds can be made on aluminum thicker than $\frac{1}{8}$ in. at speeds up to 16 inches per minute. Build-up and surfacing jobs are also improved by using LINDE's Sigma welding method.

New! Magnetic flux gas shielded arc welding—

UNIONARC Welding, LINDE's most recent development in electric welding, is an extremely fast method for welding mild steel. This method employs a continuously-fed, bare steel wire electrode, magnetically coated with flux conveyed in a stream of carbon dioxide shielding gas. Manual welds can be made easily in any position—vertical, overhead, downhand—with no stops to change electrodes. The speed, versatility, and ease of operation of of UNIONARC Welding brings costs down 25% to 65% below those of manual covered electrode welding. Clean, smooth, high-quality welds are provided, even in the presence of moderate amounts of rust, scale, and moisture.

Engineers at LINDE have been designing, developing, and testing electric welding methods and apparatus for many years. Help on any welding method is yours for the asking. You can improve your work and cut production problems by taking advantage of LINDE's experience. For data on UNIONARC Welding or any other electric welding method, call the LINDE office nearest you.

LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

Linde
TRADE-MARK

UNION CARBIDE

The terms "LINDE," "HELIARC," "UNIONMELT," "UNIONARC," and "UNION CARBIDE" are trade marks of Union Carbide Corporation.

"POURING IT ON"—
with Iron-Powder Electrodes

High-production *quality* welds are easy for the operator who uses P&H Iron-Powder Electrodes. Powdered metal in the coating raises thermal efficiency, providing speed of deposition and bead smoothness that approach submerged arc welding.

Typical applications include railroad cars, construction equipment, bridges, shipbuilding, foundry equipment, tanks, and piping.

Write for Bulletin R-29, "P&H Smootharc Welding Electrodes," for full description and specification data. Address Dept. 312B, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

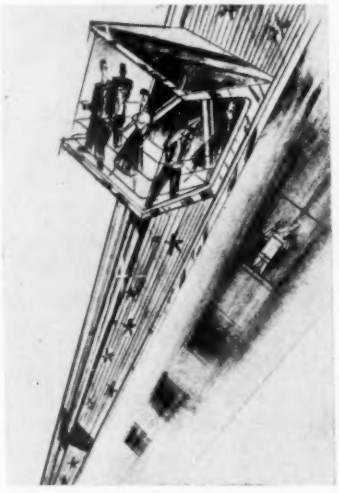
HARNISCHFEGER

P&H WELDERS · ELECTRODES · POSITIONERS
MILWAUKEE 46, WISCONSIN

BETWEEN PASSES

a low bow . . .

Goes to the following firms that have aided us in preparing this special issue on grinding wheels: Norton Co., Bay State Abrasive Products Co., The Carborundum Co., The Cincinnati Milling Machine Co., Manhattan Rubber Div., of Raybestos-Manhattan, and Chicago Wheel & Mfg. Co. We are especially grateful to the Grinding Wheel Institute for its help.



up . . . and away!

An exciting view of the San Diego (Calif.) Bay area—and of that charmingly unclad lady in the window—draws the attention of these fictional travellers in a very real conveyance. Propelled by an all-welded electrohydraulic ram, a plexiglass- and metal-enclosed elevator is now making its regular *outside* trips up and down the facade of San Diego's 15-story El Cortez Hotel. Full welding details, plus illustrations, are given on page 62 of this issue.

my fair lady

That very successful stage play recently opened in Chicago, so Graver Tank & Mfg. Co., East Chicago, Ind., used it to introduce a new dimension in business entertaining. To help celebrate its 100th anniversary, Graver sponsored a special showing of the famed musical on Nov. 13 at the Shubert Theater. Guests, numbering some 2,000, were America's top oil leaders and their wives who were attending the American Petroleum Institute's convention in the Windy City. It was Graver's way of saying "thank you" to petroleum industry customers, for whom it has built storage tanks and refinery vessels since 1859 when oil was first discovered in Titusville, Pa.

oxyacetylene safety

Gremlins in our typestick unfortunately garbled the meaning in two or three places in an adaptation done by WELDING ENGINEER ("C_2H_2—a servant, not a menace," October, 1957) of an IAA paper by L. A. Morehead of National Cylinder Gas Co. These errors did not occur in the author's paper itself.

A cylinder, of course, will *not* "decompose explosively," and even the acetylene in a properly filled cylinder will not decompose—explosively or otherwise—under normal conditions, because it is absorbed in the acetone in the filler.

Another sentence incorrectly said that if the cylinder's safety fuse melts it releases "acetylene which can be immediately sparked into an explosion by the flame." Flame, yes, due to ignition, but no explosion. Just a good time to place the cylinder in a cleared area and let the acetylene burn itself out quietly.

In two places, the word "cylinder" was inadvertently inserted in connection with repair of equipment. It should have been made clear that only authorized personnel trained in factory methods should repair regulators or other equipment, but that if there's any difficulty of any kind with a cylinder it should be left alone and a new one obtained from the supplier. Any repair work on cylinders should be left to the supplier.

Also, of course, valves do not control gas flow, as *WE* stated. Regulators do that. An acetylene cylinder valve, opened 1½ turns, gives an adequate flow of the gas and still makes it possible to close the valve quickly.

Finally, the word "connection" was omitted from a sentence explaining that there are cases where more than one regulator connection is accepted as a standard for a given gas, thus making it appear that the sentence referred to regulators instead of regulator connections. And it should be made clear here that in no case is it possible to connect the wrong gas to the wrong regulator without making additional use of a special adaptor —not a recommended practice— and that in the event a special adaptor is used it should be done only by fully qualified persons thoroughly trained in safety precautions.

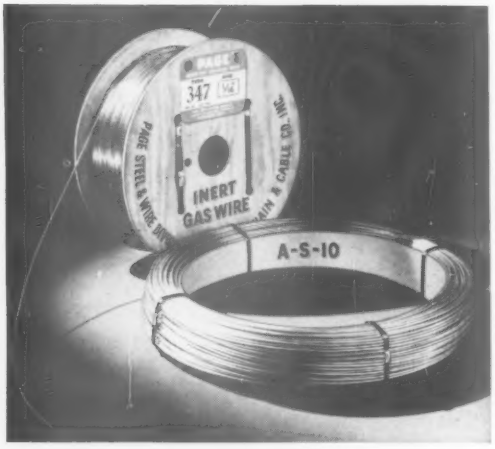
quo vadis?

Now, we're not saying that the new plant recently occupied by Lincoln Div. of Ford Motor Co. is *big*—but this plant security officer isn't pumping that velocipede out of sheer love for the sport! He —like many another Lincoln employee—has found that the shortest distance between two points in this ultra-modern but gargantuan installation is the one travelled via bicycle.

If you'd like a trip through the plant—in the relative safety of your armchair—turn to page 44 and discover the valuable uses to which Lincoln has put resistance spot welding in fabricating *unitized* 1958 models.

PAGE Welding Wire

① WIDE ANALYSIS RANGE



Here's Why You Should Buy PAGE Welding Wire

1 • When you buy PAGE welding wire, you get the benefit of PAGE's vast experience and skill in welding wire production—unsurpassed in the industry.

2 • PAGE operates its own rod and wire mills; therefore, we are able to maintain the **closest possible control** over quality.

3 • You are assured of complete uniformity of production—thanks to PAGE's continuous laboratory tests of chemical and physical properties **from billet to rod to wire.**

4 • **Making wire is our business,** our responsibility and our pride. Therefore you can rely on PAGE for the right wire for your job. And—because we manufacture a complete line of welding wires—you can accept PAGE recommendations as being free from prejudice or bias.

5 • You can get help on your welding wire problems from PAGE. We are equipped and staffed to develop special analyses for your specific use, when required.

6 • You can get **the wire you need when you need it**, through the coast-to-coast network of PAGE distributors whose local stocks are backed up by strategically-located PAGE warehouses.

7 • A local telephone call will place PAGE welding wire service at your disposal.

PAGE'S WIDE ANALYSIS RANGE MEETS ALL YOUR NEEDS

There are **33 different analyses** in the PAGE welding wire line, covering the broad application field: heavy automatic submerged arc...light manual submerged arc...inert gas manual... automatic, tungsten or metal arc, and oxy-acetylene gas welding.

AUTOMATIC WELDING WIRE

CARBON STEEL • **Any carbon from Armco (.025 max.) to high carbon (.70-.84)**

LOW ALLOYS • **All the most popular welding grades**

STAINLESS • **All standard AISI grades. Other types on request**

GAS WELDING RODS

PAGE Gas Welding Rods have long been recognized as the standard of quality, uniformity and dependable performance. These rods, in an exceptionally wide range, are furnished in coils, on reels or in 36-inch lengths, in the following materials: medium or high carbon steel, mild steel, Armco, low alloy, stainless steel, manganese bronze, naval bronze.

BARE ELECTRODES

PAGE Bare Electrodes are available in any carbon from Armco to high carbon (.70-.84).

METAL SPRAY WIRE

PAGE Metal Spray Wire is supplied in: any carbon from Armco to .80 carbon, low alloy, stainless steel, manganese bronze, naval bronze.

Send for These...

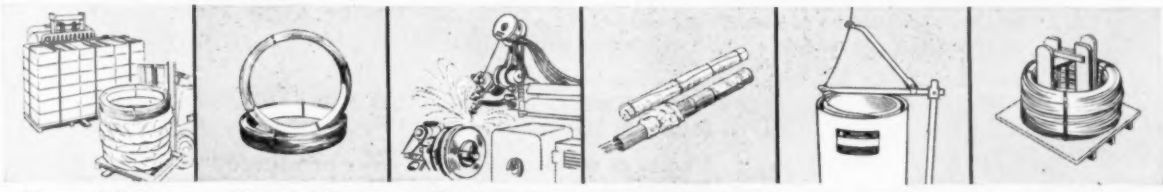
- **Folder DH-402A** • PAGE Submerged Arc and Inert Gas Welding Wire
- **Booklet DH-1277** • PAGE Gas Welding Rods
- **Welding Rod Comparison Chart...** detailing physical properties as welded of various gas, electric, automatic and spray type welding rods—also typical uses of various rods

Write our Monessen, Pa., office for any or all

offers 3 big buying advantages...

② THE RIGHT PACKAGING ③ PROMPT DELIVERY

PAGE Welding Wire is Packaged to Fit YOUR Needs . . .	Gas-shielded consumable electrodes		Filler wire for automatic or manual Inert Gas Welding	Submerged Arc Welding	Straight and cut lengths Bare wire	
PAGE *packaging means maximum protection and convenience* PACKAGING ↓ PAGE WIRE for →	Automatic Welding	Semi-Automatic Welding			Manual Electric Welding	Oxy-acetylene Welding
25-lb. or 60-lb. coils wrapped in waterproof paper, steel-strapped, single or palletized.	✓	✓	✓	✓		
25-lb. or 60-lb. coils in individual cartons, single or palletized.	✓	✓	✓	✓		
120 or 180 lb. (22″/24″ I.D.) coils, paper-and-burlap wrapped, or in cartons, palletized.	✓			✓		
Special coil sizes (on application).	✓	✓	✓	✓		
25-lb. reels (spools) in carton to fit all standard machines; single or palletized.	✓	✓	✓	✓		
Leverpaks, 15″ dia., 25-lb. coils (12″ I.D.x2½″ wide); Leverpaks, 17″ dia. 50/60-lb. coils (12″ I.D.x4″ wide).	✓	✓	✓	✓		
Payoffpaks: 20″ dia. size holds up to 500 lbs.; 23″ dia. size holds up to 700 lbs.	✓	✓		✓		
Payoffpallets, holding 900-1200 lbs. of wire (3/16″ to 3/8″ sizes, incl.) coiled around pedestal on a wooden pallet.				✓		
Paper-and-burlap wrapped bundles, containing 50 lbs. of rods in 36″ lengths.			✓			✓
Fibreboard cartons, containing 10 lbs. of rods in 36″ lengths; single or boxed. 50# and over.			✓			✓
Burlap-wrapped 50-lb. bundles of bare wire electrodes in 14″ and 18″ lengths.			✓		✓	



Wrapped Coils—Coils in Cartons | Welding Wire in Coils | Handy Reels | Gas Rod Packing | Payoffpaks and Leverpaks | Payoffpallets

Prompt Delivery from Local Stocks

PAGE Welding Wire and Rods are available from your nearby PAGE distributor backed up by PAGE warehouses (*see list below*).

ACCO

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston* Los Angeles*, New York, Philadelphia*, Portland, Ore. San Francisco*, Bridgeport, Conn.
**Indicates PAGE warehouse stocks*

ACCO for Better Values

THE 479 DAY TEST:

it's a RECORD!

We knew they were good . . . the trade knew they were good . . . welding engineers knew they were good. But nobody was prepared to forecast that the new Miller line of GOLD STAR welders would erect a startling milestone in welding history . . . in welder performance!

In August, 1956, Miller began production on a new completely sealed semi-metallic rectifier. The date proved to be significant in welding circles. For 479 days later **NOT A SINGLE FAILURE HAD BEEN REPORTED FROM THE FIELD!**

A new transformer design teamed with the revolutionary completely sealed semi-metallic rectifier led to the introduction of the Miller GOLD STAR series of rectifier type dc and combination ac-dc machines.

Today, weldors everywhere agree that Miller GOLD STAR machines give you:

a. The best welding current ever produced,
b. Record-making dependability.

The 479 day test was made on thousands of Miller GOLD STAR welders working under every conceivable condition—indoors—outdoors—in hundreds of industries.

Here indeed is an all-time record for welder and rectifier reliability.

miller ELECTRIC MANUFACTURING CO., INC.

distributed in Canada by CANADIAN LIQUID AIR CO., LTD. Montreal

APPLETON, WISCONSIN

DECEMBER, 1957

Welding Engineer

ESTABLISHED 1916

Ratified by readers

WELDING ENGINEER's October editorial had two major purposes: to point up the fact that shop-training programs are faltering in many college engineering schools, and to ask the assistance of every reader in revitalizing this much-needed segment of every good school's curricula.

Of the many readers who responded to this appeal, one in particular indicated an especially acute knowledge of the present problem. He is Harold P. Hayes, dean of engineering at California State Polytechnic College in San Luis Obispo. Here are his enlightening comments.

"Congratulations on your outstanding summary of a difficult problem. You are correct in saying that welding instruction is rapidly vanishing from the engineering education picture—despite the fact that the welding industry has done a remarkable job of supplying equipment and instructional aids to interested schools.

"The welding industry has also done a good job in emphasizing the need for welding knowledge by engineers in other fields. But, unfortunately, the industry is prone to be over-impressed with statements of engineering educators, and it fails to defend its position.

"We sometimes feel that the teacher-pupil relationship carries farther into industry than it should. A good example of this is the fact that nearly 10 years ago, a survey was made on behalf of the welding industry to determine the extent to which welding was being covered in engineering colleges. The problem was brought fairly well into focus at that time.

SIMULTANEOUSLY, the Engineers Council for Professional Development, the recognized accrediting agency for engineering colleges, moved strongly away from consideration of practical arts and into the field of engineering science. So, although the survey showed more welding instruction was needed, the ECPD, in effect, has caused it to vanish rapidly from the scene.

"Probably the best summary of what is happening is contained in the 24th annual report of ECPD: 'There is a wide-spread recognition that the art of technology and engineering practice must take a role secondary to sound grounding in science. The degree of acceptance of these ideas . . . has been indeed notable across the country.'

"At our college, we have elected to resist ECPD regimentation toward engineering science, and have stood by our convictions that practical arts deserve a prominent role in engineering education. Frankly, such a stand takes tremendous energy and tends to put us constantly on the defensive—and makes us seem overly-aggressive in promoting our program.

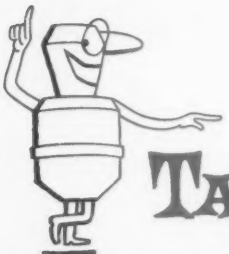
WE AS A COLLEGE would have difficulty in telling ECPD that its requirements are wrong and that there should be more programs of the type we sponsor. If we were to do so, it would sound like a "sour-grapes" approach. This portion of the battle must be conducted by the welding industry through its formal organizations.

"Has the welding industry ever said to ECPD that it is wrong in squeezing welding instruction out of engineering programs?

"Your editorial is one step in alerting the industry to a pressing problem. However, the situation cannot rest here—the industry must carry your message to the ECPD.

"Engineering educators have stolen the show from the welding industry, with the result that industries benefitting from research and engineering science training are getting personnel equipped to do their work. Industries dealing with engineering applications are suffering—unfortunately, in silence.

"We offer these rather blunt remarks with a sincere feeling that they may help correct what we both believe to be a very unreasonable situation."



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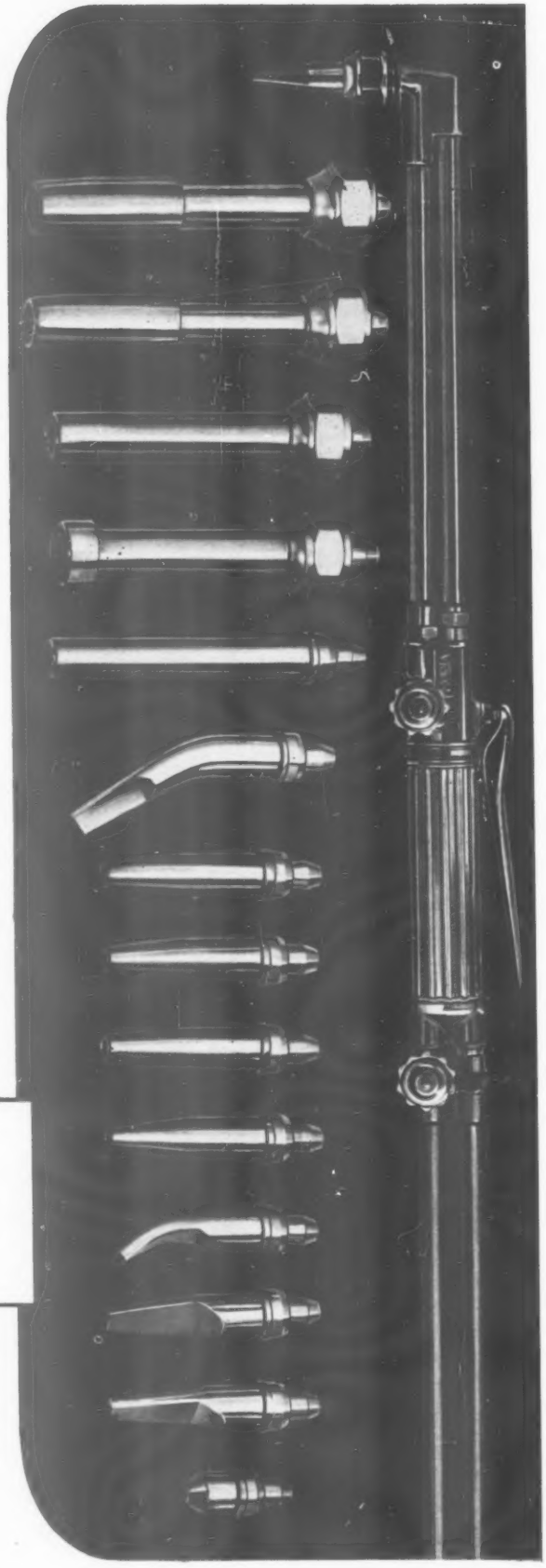
(You'll be glad you did)

SELECT FROM MORE THAN 35 TYPES, SIZES FROM 000 TO 16

No matter what your cutting needs — from light preheating to heavy underwater cutting — there's a right Victor tip for each job.

PRECISION MADE — Specially designed machines and time-proven methods, developed during Victor's 40 years of tip manufacture, assure you consistent, efficient performance from each tip. Carefully proportioned preheating and cutting orifices, accurately finished on polished mandrels, produce free-flowing gas jets which enable you to use lower, more economical gas pressures. Exactly machined tapered seats assure absolutely gas-tight fit in Victor Cutting Torches. Finally, each Victor cutting tip is flame tested to insure you perfect flame and cutting jet characteristics.

Why work with misfit or "bootleg" tips? Get the right Victor cutting tips for your jobs NOW from your Victor dealer.



WRITE FOR FREE TIP SHEET

VICTOR for welding

Pictures and describes complete line of Victor cutting tips, tells what Victor torches each fits. Just ask for Cutting Tips Bulletin 314.

43

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

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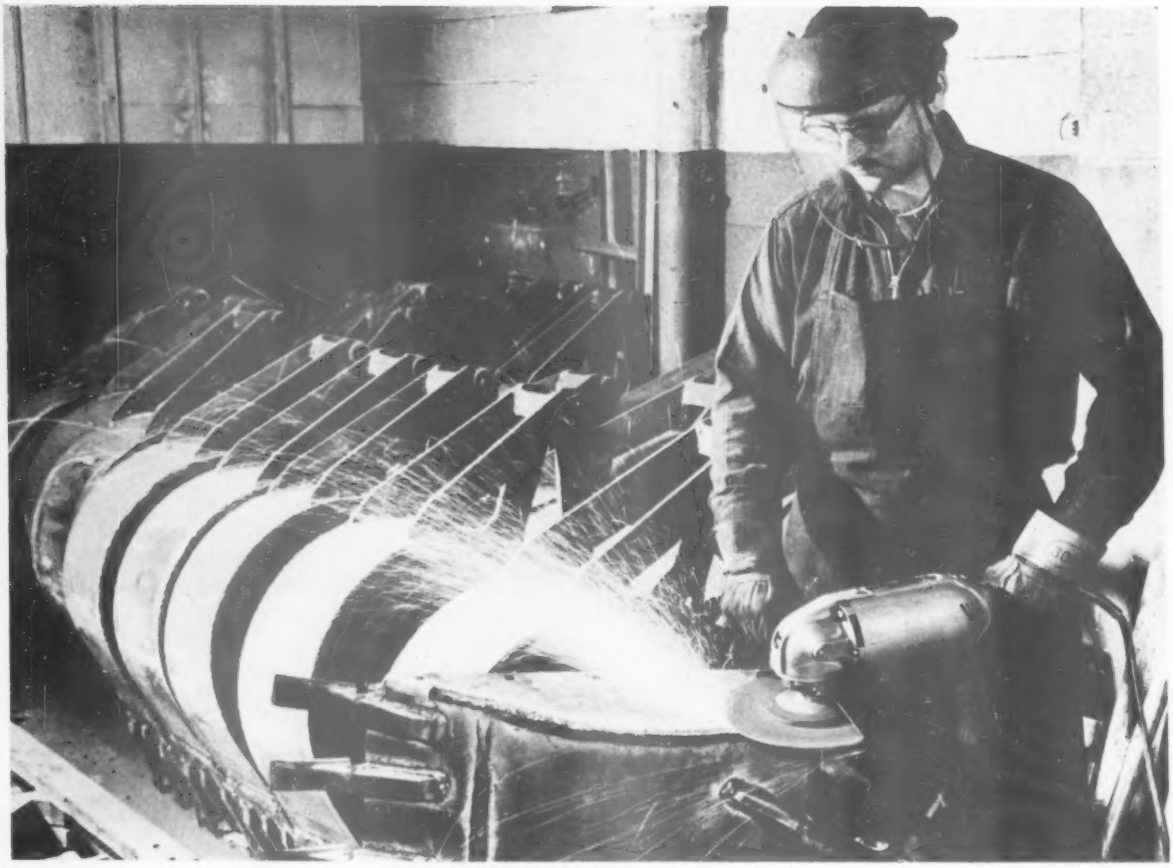
As a grinding wheel user . . . . . .

Do you know the meaning of
structure?
grade?
grain?
bond?

If you're not sure—absolutely sure—
then this month's WELDING ENGINEER was
written with YOU in mind.
The answers to these questions
will be found within the 13 pages
that have been set aside
to supply you with information
that will lead to better
weld preparation and
better weld finishing.

Here they are . . .



From sandstones to diamonds— the grinding wheel story

By F. W. Foerste

THE STORY OF ABRASIVES probably began when an ancient hunter discovered he could use a hard rock to chip and shape his flint weapons.

But not until after the twentieth century's birth did abrasives come of age. Then their popularity rose with skyrocket speed.

Early Stages

It was the automobile that took grinding wheels out of the backyard and put them on the production line. The need for dimensional accuracy, interchangeability of parts, and the necessity for mass production was solved, in part, by then-recent developments in abrasives.

Until Henry Ford and his galloping gaspots chugged up the pike, most familiar of all abrasive wheels was the grindstone. Made of sandstone, they were familiar sights in most farmyards.

But, however effective they were on the farm, grindstones would never have fitted into modern production.

A step in the direction of modernization was taken about 1840-1860 with the development of emery wheels. Screened emery, containing corundum, was mixed with clay and bonded (fused) together. These wheels were commonly used to size and shape harden tool steel for production work and, later, to smooth off bumps, protrusions, and other outsize formations.

But emery is a temperamental mineral and was shortly to abdicate its position in favor of more reliable abrasives.

One heir to the emery wheel dynasty ascended the throne in 1891. Kingmaker was Dr. Edward Acheson, a researcher of note, who refined silicon carbide, which he called carborundum.

Modern silicon carbide, as evolved from Acheson's experiments, is made of white quartz, petroleum coke, silicon dioxide, salt and sawdust. This mixture is placed in resistance type furnaces under intense heat. When removed, silicon carbide forms a core surrounded by raw materials not changed by the process.

Another researcher hit upon an additional abrasive form when he mixed bauxite, coke, and iron borings. He placed the composition into an arc

REINFORCED resinoid disc-wheels are strengthened with glass cloth the worker holds. Example of finished work is seen on right.

PREPARING molds to form 6-in.-diameter cup wheels seen in foreground. These wheels are widely used on portable grinders.

furnace and baked out aluminum oxide. The fused material was crushed and grains were graded according to size.

Finally, as every schoolboy knows, diamonds are the hardest of all substances, but few schoolboys, and not very many more adults, realize a majority of gems are not used as jewelry, but as abrasives.

Substandard diamonds—those containing impurities—are called borts. These borts, when bonded to wheels, are used to cut glass, stone, ceramics and other hard materials. Diamond wheels are important to weldors because they can dress and true other grinding wheels.

Every abrasive should have two properties: (1) ability to cut other substances (hardness) and (2) resistance to wear (toughness).

But no abrasive perfectly combines hardness and toughness. For this reason, each of the three major abrasives — silicon carbide, aluminum oxide, and diamonds—is best fitted for a different type of work.

Abrasive Uses

Silicon carbide is harder than aluminum oxide but not as tough. Therefore, it is used on low tensile materials. These materials allow it to penetrate easily, but do not break, or fracture, abrasive grains. Silicon carbide wheels are used to grind soft bronze, aluminum, hardfacing alloys, copper, stone, marble, 18-8 stainless steel, gray iron, chilled iron and cemented carbides.

Purity of the abrasive will affect its color and its hardness, i.e., green silicon carbide is one of the purest and hardest of all synthetic abrasives. By changing its degree of purity, silicon carbide's hardness and toughness can be increased or decreased.

On the other hand, aluminum oxide is very tough. It is not, however, as hard as silicon carbide. High tensile materials, which would rapidly fracture silicon carbide, have little effect on aluminum oxide. The purity of aluminum oxide changes its characteristics, too. White (almost pure) aluminum oxide is very tough.

This abrasive is used on high tensile materials like carbon steel, annealed malleable iron, hard bronzes, alloy steel, high speed steels and wrought iron.

Diamonds, hardest of all cutting materials, are used to grind ceramics, quartz, cemented carbides, gems, marbles, glass, and granite.

In addition to these qualities, abrasives are classified by grit (grain) size. Grits are graded by sifting them through screens. Screen openings determine size. For instance, a number 30 grit is relatively large (passing through an 0.232-in. square hole —30 holes per in.) whereas number 120 grit will drop through a 0.0035 -in. square hole—120 holes per in.

Because of these gradations, grinding wheel specification charts, which are available from most manufacturers, list grain sizes ranging from a very coarse #10 to a very fine #600.

Choosing Proper Grits

How is proper grit size to be chosen from this abundance of riches? In answer . . . when grinding hard, brittle metals, a fine grit should be used. Fine grit is applied when area of contact between wheel and workpiece is to be kept small, or when mirror-bright finish is desired. These grits are also desirable when close tolerances are specified.

Coarse grits are better on soft, easily cut, ductile materials, and when much stock must be removed. If a large area of surface contact must be covered, most experts like coarse grains.

One of the most mysterious terms to a layman choosing a grinding wheel is "bonding." This need not be mysterious. For bonding is simply the agent holding abrasive grains together.

There are six forms of bonding elements: (*1*) vitrified (ceramic) (*2*) resinoid (synthetic resin) (*3*) silicate (of soda) (*4*) oxychloride (of magnesium) (*5*) rubber (*6*) shellac.

Although all these bind grains together, the strength with which they

do so can be controlled during the manufacturing process. Moreover, it is important to grasp the fact that bonds do not have a cutting effect. Nevertheless, the more firmly grains are held by the bond, the harder wheels will be, since grains do not free themselves so easily.

Vitrified Bonding

Most important of all bonding agents is vitreous, or ceramic. Because vitrified bonding is used in over 50% of all wheels, this synthetic material will be discussed first.

To vitrify means to change materials into a glassy structure by heating and fusing them. Most commonly used as vitrified bonds are flint, feldspar and clay, blended with abrasive grains.

Resistance to acid, oils, water and ordinary temperature variations are some advantages of this bond.

Vitrified bonds are rigid and therefore are applied to wheels removing a great deal of stock. Because of these last two features, wheels with vitrified bonds must not be run at speeds over 6,500 surface feet per minute (sfpm).

Resinoid Bonds

Resinoid bonding is, as the name implies, made with a resin. In fact, scholars believe the first grinding wheels were bonded with tree gum. Modern technology has gone far beyond tree gum. But the basis for resinoid-bonded wheels is still a gum offshoot: powdered phenol formaldehyde resin.

This resin is mixed with abrasive grains, molded into wheels and baked in electric ovens at a normal temperature of 350 F. When cooled, the wheel is completely bonded.

Resinoid-bonded wheels are especially successful when applied to rough grinding, on billets, or when high speeds and great strength are vital.

Another type of resinoid bonding is used in reinforced wheels. Wheels made in this way are formed of many abrasive impregnated layers, with extra strength added by bonding-in a layer, or layers, of a reinforcing material.

Material in these layers adds to the wheel's flexibility or to its rigidness. For example, cotton layers make wheels more supple and nylon layers make them more rigid. This type of wheel is much in demand because of its many uses.

Resinoid-bonded wheels, however, do have limitations. Unlike vitrified bonds, resinoid bonds are affected by alkaline solutions—important when wet grinding.

Rubber Bonding

Crude rubber and sulphur are the main ingredients of rubber-bonded grinding wheels. In a process not unlike vulcanization, these are mixed with abrasive grains; the composition is passed under rollers and sheets are stamped out, or pressed in molds to make thicker wheels. Bond and abrasive are fused under heat and pressure.

When used wet, rubber-bonded wheels are excellent as cut-off tools —especially when little burn or burr is desired.

Wheels bonded with rubber are excellent for finishing such metals as stainless steel, and when grinding sprues, fins, and gates from castings. Rubber bonds also are used on centerless feed wheels.

But rubber-bonded wheels do have drawbacks; chief among these is the material's susceptibility to attack by oils. For this reason, grinding with rubber-bonded wheels requires care in choice of coolants.

Shellac Bonding

Bonding with shellac is done by mixing flake shellac and abrasive grains in a steam-heated kettle. Wheels less than $\frac{1}{8}$ in. thick are molded; thicker wheels are baked in quartz sand.

Wheels bonded in this manner are frequently used for finishing and sharpening operations. But, in addition to being affected by alkaline solutions, shellac-bonded wheels do not respond well to shaping by diamond wheels and break down under heavy use.

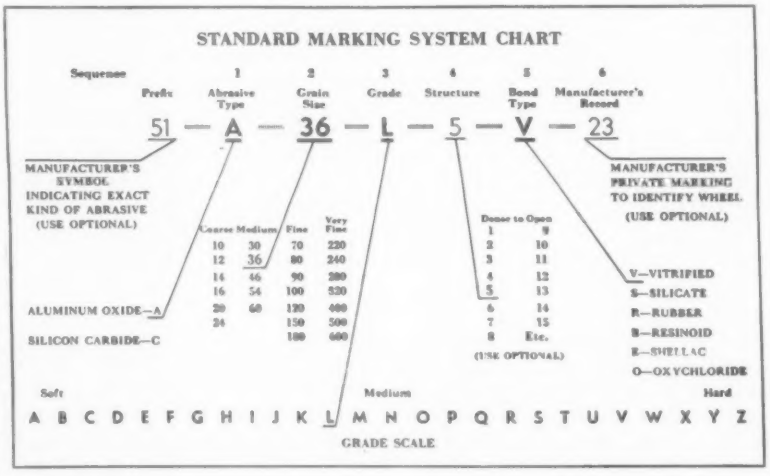
When oversize grinding wheels must be used, and when heat must be kept down, silicate-bonded wheels are often chosen.

These wheels are made by molding abrasive grains with silicate of soda. Molds are baked at medium temperatures from one to four days. Heaviness of tamping determines the proportion of bond to abrasive.

The advantage of silicate-bonded wheels is that the softer bonding frees abrasive grains easily, exposing new cutting surfaces to the workface. Because of this, silicate-bonded wheels are used extensively on edge tools and gear teeth. However, the material can be eroded by alkaline solutions.

Oxychloride Bonding

Oxychloride-bonded wheels are made with whatever oxide is desired, and with chloride of magnesium. After abrasive grains are added, wheels are formed and allowed to age—no heat is required.



STANDARD marking chart will help you identify grinding wheel components. Abrasive forms, grain size, grade, structure and bond type are all listed to facilitate recognition of grinding wheel label markings. Used with this article, the chart may enable you to select a proper grinding wheel for your shop.

Such wheels are easily ruined by grinding fluid action and so are always used dry. Despite this, they are in demand because of their cool cutting action. Needing no fluid, oxychloride-bonded wheels are often employed in disc grinding.

Rubber, shellac and resin—all organic bonds—are too flexible to be easily contoured by crush forming. But this same flexibility makes high-speed grinding (over 6,500 sfpm) possible. Below that speed, vitrified-bonded wheels are best.

Very closely related to grit size and bonding is what grinding wheel experts call "grade." The hardness or softness of a wheel depends, to a great extent, upon its grade.

Wheel grade, in turn, is dependent upon bonding. If a bonding agent holds grains solidly, the wheel is hard. If bonding is not strong, the wheel is said to have a soft cutting action.

A rule of thumb on grade is this: "The more bonding material that is used, the harder the grade will be." This is true because the greater amount of bond presents a firmer foundation for grits to rest in.

Grade Choice

Determining wheel grade for a particular job often presents a problem to the average welding supervisor.

The following suggestions will be of help to such persons. *Soft grades* allow abrasive grits to tear away from the wheel, exposing new grains for better cutting. *Hard grades* present a continuous line of grits which part from the bond only reluctantly.

When a grade is too soft for a particular job, however, numerous problems appear. Wheel wear is excessive, poor finish is given, scratches are made, and wheels must be replaced too soon.

Harder grades release grains more slowly so difficulties listed above are less serious. However, a too-hard grade will load up with cut metal (swarf) in the spaces between abrasive grits. The wheels will glaze, squeal and, if care is not taken, even burn the work.

On grinding wheel charts, softer grades are indicated by lower alphabetical notations. Harder grades are distinguished by their higher letters. Thus, "A" for soft; "Z" for hard.

Wheel Structure

Because grinding wheels chip away metal much the same way an axe chips away wood, the spaces between grains become important. These spaces comprise the wheel's *structure*.

This structure is again a matter of bonding. The more bonding material added, the more *open* the structure will be. The less bonding added the more *dense* the structure.

An open structure allows more metal to be cut because chips have greater spaces through which to escape. Open structures are best for surface grinding when large amounts of stock must be removed.

Denser structures cut less stock and thus are ideal for fine finishes and close tolerance work.

Structure also controls the amount of coolant reaching work surfaces, as well as the depth of cut. On wheel charts, dense structures are given low numbers and open structures are assigned higher numbers.

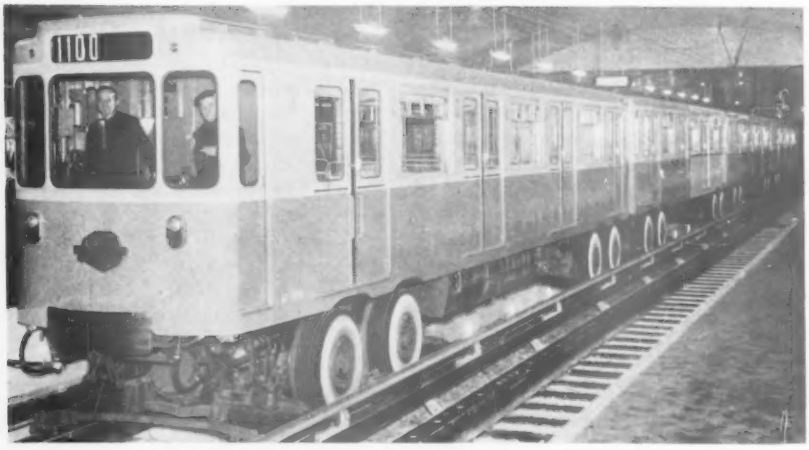
Readers probably will have noticed at this point that structure will affect wheel grade, making it harder or softer as the structure is opened or closed.

This complicated relationship of abrasive, bond, grit size, grade and structure has caused supervisors to lie tossing in their beds at night when forced to select wheels for use in weld preparation and finishing operations.

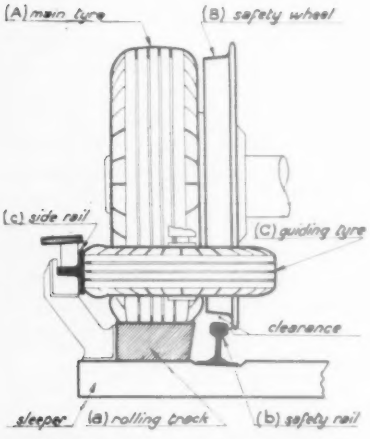
Fortunately, grinding wheel manufacturers employ salesmen who are only too pleased to be called upon in such circumstances. These representatives usually lend their strongest efforts to successful solution of grinding wheel problems.

As a supplement to this knowledge, WELDING ENGINEER presents another article in this issue which suggests ways of choosing a machine and grinding wheels for your shop.

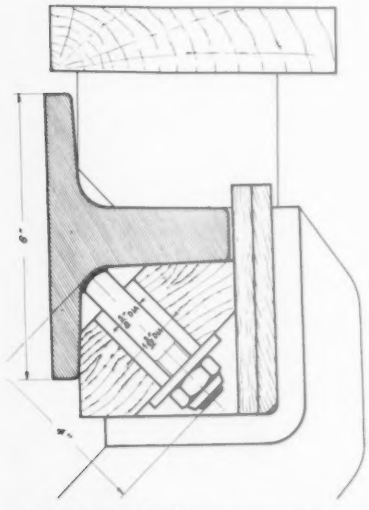
CONTRAST in size of work which can be ground is seen in these two photographs. Small unit is a bushing being around with a small mounted point wheel. Larger unit is a conical tank almost swallowing the workman finishing inside welds.



READY to roll . . . with a lack of noise that elates passengers. Each coach on this train in the Paris subway is fitted with eight pneumatic tires and an equal number of smaller, horizontally-positioned tires that contact side rails and guide train.



SKETCH indicates important elements that help propel, guide and protect world's first pneumatically-tired subway train.



CROSS-SECTION shows 45-deg placement of 5/8-in.-diameter stud through insulating block to fasten side rail. Rail guides train and carries traction current.

Le quiet way to travel . . .

Paris trio wins $1,500 for an important use of welded studs

FOR THE YEAR's most outstanding contribution in the field of semi-automatic electric arc stud welding . . ." read the qualifying phrase in the contest announcement initiating the first annual $1,500 Gregory Award.

Sponsored by Gregory Industries, Inc., of Lorain, Ohio—whose Nelson Div. manufactures stud welding equipment—this first award of its kind was made on November 5 to Messrs. Faure, Lechartier and Loubignac of Paris, France.

All are engineers with the Paris metropolitan subway system, and they received public recognition for their valuable stud welding application at an American Society for Metals luncheon in Chicago's Congress Hotel.

It was in the world-famous "Metro" (subway), of course, that the prize-winning trio put stud welding to work. This process helped the transportation system to place a pneumatically-tired train in operation on one of its 14 lines.

In the words of the engineers submitting the contest's top descriptive paper, here is how stud welding helped launch this noiseless innovation in the transport industry.

Cost: $11,400,000

¶ On Nov. 8, 1956, the Paris Subway and Surface Public Transport Authority put into operation the world's first pneumatically-tired subway train. Total cost of rolling stock and track modification amounted to approximately 4 billion French francs ($11,400,000 in U. S. currency).

Results of the first months of operation are excellent, and passenger comfort, operational flexibility and traffic improvements have persuaded the Transport Authority to plan an extension of this train modification program to all its lines.

Coaches rolling on truck-type pneumatic tires which follow flat wooden rails obviously cannot be guided by conventional means. The system used in the Paris subway comprises four slightly smaller, tire-fitted wheels mounted horizontally on the bogie (truck) to follow side rails which parallel the main track.

In those instances where switches and crossings interrupt continuity of

side rails, lightweight steel wheels mounted behind their rubber counterparts perform an important guiding function. The subway's original metal rails have been left in place, and flanges on the steel wheels contact them when passing over switches.

Naturally, the presence of the steel wheels constitutes a vital safety feature in case of tire blowout, and these discs also act as brake-drums.

BOGIE is flopped to show welded H-frame; truck-type differentials; motors fixed longitudinally; horizontal guiding wheels; heavy-duty rolling wheels, and inner steel wheels.

Track Set-Up

With the original steel rails still in place, pneumatically-tired coaches and standard types can travel one after the other without traffic interruption. Ballast and ties used before introduction of rubber-tired coaches have also been left intact, but the conductor rail formerly used was removed. The metal side rail now performs this function.

The new track set-up called for three separate stud welding applications.

1—The side rail has to be supported by steel brackets bolted onto the external side of the wooden track. Each bracket is fitted with an insulating block. Two 5/8-in.-diameter studs, welded at a 45-deg angle in the lower angle of the "T" *(see sketch)*, insure correct fastening of side rail to block. There was no need for horizontal and vertical studs; necessary tightening action was obtained on vertical and horizontal faces of the insulating block.

2—To prevent any danger of electrocution when maintenance workers make future track repairs, a safety device covers the side rails—which are located alongside service lanes. This device is composed of wooden planks screwed on insulating blocks. The blocks are fastened on side rails by 5/16-in. studs welded in a horizontal position by the wood-decking method.

3—Cable lugs conducting electric current are tightened against the web of side rails by 5/8-in. *copper* studs, selected for their high conductivity. This may be the first time that copper studs have ever been welded to steel on such a large scale.

On the Job

Work done on the subway could not interfere with traffic, so the modification was done during those hours of the night when traffic was normally stopped. Taking into account the time necessary to bring service cars into position, actual duration of work couldn't exceed 3⅓ hours a night.

(And adding to engineers' headaches was the fact that nothing could be left at the job site when traffic resumed in the early morning.)

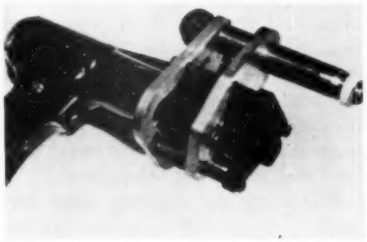
Four service cars were used, and each carried a full cargo of stud welding equipment. Two of the cars handled the welding of studs for side rail fastening. One stocked 5/16-in. studs to fasten safety planks, and the fourth carried the copper studs for cable lug connections.

High Amperage

Because of time and cost considerations, automobile batteries were substituted for d-c generators in supplying welding current. The batteries were charged by d-c generators fed with the only available energy source: the 600-volt d-c traction current.

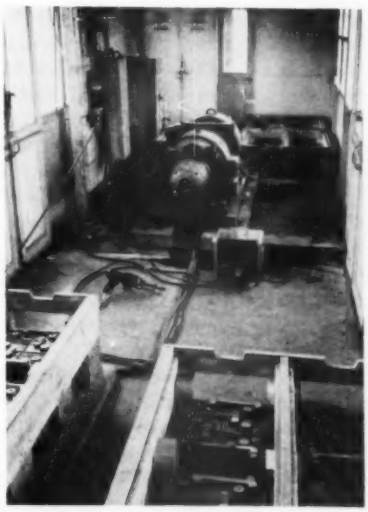
In the first two service cars, battery output was 2,000 to 2,500 amp

ONLY one of Paris subway's 14 lines is presently fitted for operation of pneumatically-tired trains, but full conversion is planned.



STANDARD stud welding gun is modified to permit easier use in cramped quarters.

COPPER studs were welded to steel on a large scale for cable lug connections.



INTERIOR of service car shows automobile batteries that supplied welding current. Generator charging batteries was fed with 600-volt d-c traction current.

TWO views (*above and right*) show gun placement for stud welding during side rail fastening operation. Tubular leg fitted to standard gun insured correct postioning of ⅝-in. stud in hole drilled through insulating block.

under an arc voltage of about 30 volts. Open-circuit voltage was 72 volts.

This amperage may seem high, but it was actually determined only after careful tests. It can be explained by the 45-deg angle of the studs, the important volume of the side rail, and the nature of its steel.

Steel used in side rails was a converter type with normal current-carrying capacity. It met mechanical and electrical specifications which were fixed following strength and resistivity tests. Weldability of the steel did not seem good during tests, but results have been excellent.

Working Details

Each of the two service cars handling the side rail job was equipped with two stud welding guns, manufactured by Nelson but modified to suit them to the job at hand. Locations were often cramped, so the guns were fitted with a tubular leg to insure correct positioning in the holes drilled in insulating blocks.

Cable lengths also were increased, allowing each weldor to move 130 ft in front of, or behind, service cars. Owing to this cable length increase, of course, a cable sectional area of 100 sq mm was used.

Each of the remaining two cars carried one stud welding gun apiece. These were also manufactured by Nelson (as were all studs) but were not modified.

On the side rail job, rail laying and stud welding had to be smoothly coordinated. Essentially, this operation had two preliminary steps: *(1)* brackets were bolted to external sides of the wooden tracks and insulating blocks were fastened on the brackets; *(2)* side rails were distributed alongside the track and eventually curved.

The first team of workers put side rails on the brackets by hand and fastened them temporarily with clamps. Following these men were two stud welding operators, one on each side of the track. They welded one stud through each hole drilled in insulating blocks, using the holes as templates. Handling of the heavy rail bars was obviously minimized.

Following the weldors were two more workers who screwed safety nuts on the studs and removed the clamps. This completed side rail fastening.

The team welding the 5/16-in.-diameter studs worked independently, and began their operations whenever a sufficiently long length of side rails had been fastened.

Distance between two successive studs on this job corresponded to the standard length of safety planks being fastened—4 ft.

Insulating blocks were laid upon the web of the "T" and maintained at proper mutual distance by means of a template. The stud was welded in the hole by the wood-decking method, and the block was fastened immediately afterward with a washer and a nut screwed in as soon as the stud cooled. The safety planks were then screwed down.

Economic Factors

The ⅝-in. copper studs were welded by still another team, who positioned them with the aid of a template.

A total length of 92,000 ft of side rails (two of them per track) were laid for this job. Stud welding operators placed 41,000 steel studs (25,000 of which were ⅝ in.) and 2,000 copper studs.

Four gun operators were busy during 44 nights in April and May, 1956 (total time required on the job) welding the ⅝-in. steel studs. Each man welded an average of 142 studs per night—corresponding to laying 525 ft of side rails each night. Time necessary for setting the rails and moving service cars is included in computing these averages.

The only operator welding the 5/16-in. steel studs placed an average of 250 studs per night. This corresponded to laying 1,000 ft of safety planks.

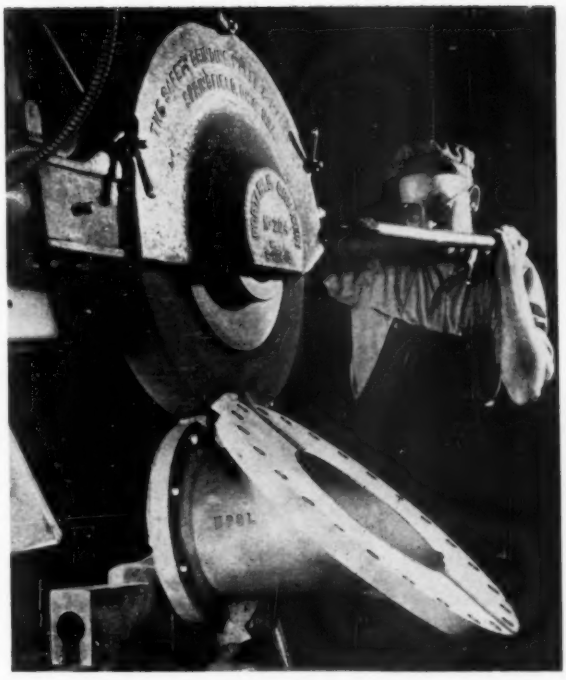
Owing to their irregular distribution along the line, average efficiency of the copper stud welding job has not been computed.

Total Savings

Manpower and supply costs for fastening side rails with the stud welding process was 12 million francs ($34,300). The other joining process initially considered would have resulted in costs of 37 million francs ($105,500) and a time expenditure of 4 months.

The application of welded studs to fasten safety planks netted further savings of $14,250 over the other likely process—resulting in a total job savings of $85,600.

Owing to its advantages in this field operation, the stud welding process permitted true production-line application. Side rails came from the rolling mill to their final position without the need for any preliminary marking or special lay-out.



LARGE swing frame grinders like this one are used when material to be ground is too heavy to carry to a floor or bench grinder for work purposes.

Choice of grinding wheel and a machine to apply it isn't a matter of luck, it's based on . . .

Understanding grinders and grinding wheels

THERE IS a need in *every* welding shop for grinding wheels. Operations in some shops, of course, demand greater abrasive applications than do others. But two simple facts remain: grinding wheels save time and effort . . . they promote accuracy in fabrication.

Why, then, are there still countless welding jobs that beg for a grinding wheel? On the basis of an informal WELDING ENGINEER survey, the answer is plain enough: more weldors *would* use grinding wheels . . . *if they knew more about them.*

Weld Grinding

For those weldors and welding supervisors who have tended to lump grinding wheels in that broad category termed "The Great Unknown," this article is intended as a short guide. It should dispel, to some extent, the fog of doubt that has prevented a more complete acceptance of grinding wheels in many areas.

Uses for grinding wheels are many. Among them we can count cutting-off, gear grinding, tool sharpening, thread grinding, cylindrical grinding, honing and internal grinding.

An attempt to describe all these techniques here would be out of order, however, since only a few are used in conjunction with welding procedures.

Vital grinding wheel applications in welding shops which use them are: (*1*) preparation of edges on metal to be welded, and (*2*) finishing the completed weld. Some surface grinding and cut-off work also is done, of course, but these abrasive uses are secondary to preparation and finishing, both in practice and in popularity.

What machine types are used for most grinding work in welding shops?

Three machines have risen far above all others in weld grinding. They are floor and bench grinders, swing-frame grinders, and portable grinders. Specialized equipment *has* been developed; but in the main, these three are most popular for weld preparation and finishing.

Floor and bench grinders are rugged units. As their names suggest, they are either attached to benches or stand on the floor. When movable weldments are involved, either machine may be used to advantage.

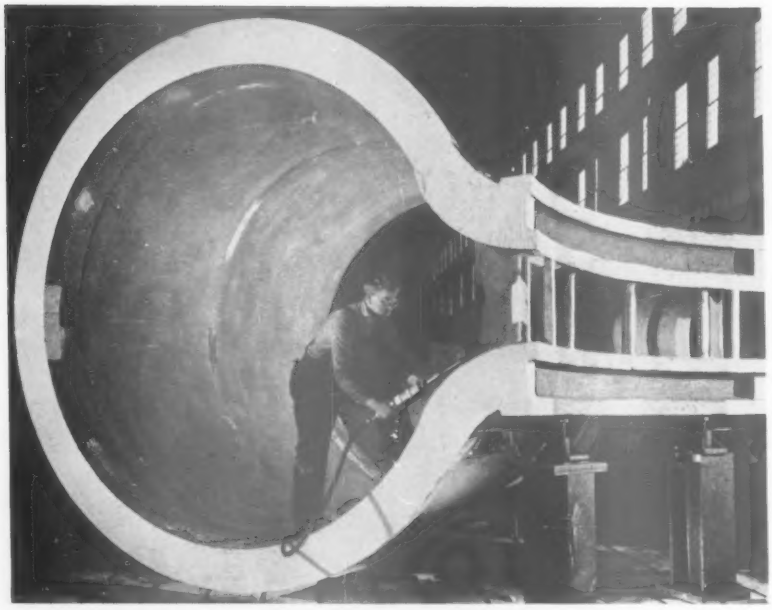
Wheel Sizes

Some of these machines can handle wheels with diameters as small as 6 in. Generally, however, wheel size ranges from 12 to 36 in. Larger wheels are employed on heavier grinding operations, and smaller ones for light work and finishing.

The speed of grinding wheels mounted on bench or floor grinders is controllable to allow for wheel wear—*i.e.*, as wheels become worn, speed is upped to compensate for a loss in efficiency.

Swing-frame grinders were designed to handle workpieces too heavy to be moved to bench or floor units. Such grinders are often suspended by chain hoists from jib cranes. This arrangement permits them to be moved in or out of the work area with ease.

Swing-frame grinders can be adjusted for at least one speed change. Wheel sizes can be obtained in 16 to 24-in. diameters. These machines offer more mobility than floor or



THIS large spiral casing for a hydraulic turbine is being ground after it was welded. Portable grinders are often used when the worker must go to the work because of weight or size problems.

bench grinders but often are ineffective for hard-to-reach welds.

Most versatile of the three types is the portable grinder. Although fixed and swing-frame grinders operate only electrically, portable machines can be powered pneumatically, electrically, or by a flexible-shaft arrangement. For average shops, selection of specific power source will be gaged by the set-up which gives most horsepower per pound of weight.

Any number of differently shaped wheels can be fitted to portable grinders. With straight wheels, flaring cups, straight cups, cone wheels and plug wheels available, a weldor can usually find a type to meet all his grinding needs.

Because of their adaptability and easy handling, portable grinders are very popular in welding shops. The latter factor is a disadvantage, however, when abused (but this is hardly the machine's fault!).

How is a grinding wheel chosen?

Experts have assembled a list of eight conditions which must be understood before attempting to select a wheel for a particular job. They are:

1—Kind of material to be ground.
2—Amount of stock to be removed.
3—Size of wheel.
4—Grinding machine type.
5—Wheel speed.
6—Work speed.
7—Condition of machine.
8—Operator's skill.

Kind of Material

A list of metals which can be ground would be virtually identical to a list of those which can be welded. And, just as in welding, grinding wheels cannot be applied until pertinent qualities of the metal — its hardness, brittleness, ductility, etc. —are known.

Once metal which will be ground has been identified, the grinding wheel user's next consideration is the abrasive type he will use. Aluminum oxide, for instance, is preferred to silicon carbide on high-tensile steels.

The reason? . . . aluminum oxide is tough, and grains will not fracture before they become dull. Instead, grain layers wear away and offer fresh abrasive cutting edges.

The hard and brittle metals—brass and aluminum, for example—are ground best with a silicon carbide abrasive. Stresses encountered on these low-tensile materials allow silicon carbide to wear more slowly, and permit its superior hardness to cut more stock.

Manufacturing techniques can modify characteristics of abrasive materials. And, by studying manufacturers' charts, weldors can find abrasives combining the features best suited for particular jobs.

Grain Size

The kind of material being ground also dictates the grain type to be used on it. Fine grains are best for hard, brittle materials. Coarse grains are best for soft, ductile materials.

Therefore, if a tough bronze were to be ground, a logical abrasive choice would be coarse aluminum oxide grains.

Similarly, brass, which is hard and brittle, would call for fine grains of silicon carbide.

Amount of stock to be removed, accuracy required, and finish needed are factors dependent upon abrasive, grit size, bond, grade and structure of a grinding wheel. The correct wheel choice can boost efficiency and lower costs.

Coarse grains, for example, remove more stock than do fine grains. But the finish they give is often not smooth, and final texture will be rough. (This, of course, is ideal when specifications call for a roughened surface for painting.) Ready-to-sell finishes can be obtained with fine-grained abrasives.

Grain Structure

Almost everyone knows that a crosscut saw will slice through a tree faster than a hacksaw. Teeth in the crosscut are larger, and spaces between them are wider. These features enable the saw to bite more deeply into the wood, and to pull out more sawdust.

This comparison may be carried over to grinding wheels. But instead of saying "teeth" we say "grains"—and the spacing between grains is termed "structure."

The grinding wheel with an open structure will cut more metal. It will not, however, give a smooth finish. Weldors who are principally concerned with finish, and care little for stock removal, select a wheel with dense structure.

When deep cuts are necessary in preparing metal for welding, a vitrified bond is chosen by most experts. But the fact that vitrified-bonded wheels must not be run over 6,500 surface feet per minute (sfpm), does place some limitations on use of this bond.

Thus, when greater speeds are called for and a large amount of stock is to be cut, knowledgeable

FLOOR stand grinders similar to this one are employed when weldments are small enough to be moved. This particular machine employs an abrasive belt, but straight wheels are very frequently used as well. Speed of the grinder will help users choose proper bonding for their wheels.

abrasive users choose an organic bond: resinoid, shellac or rubber. Such bonds also seem to impart a finer finish to metal.

In most situations, wheel size is determined by the type of grinding machine in use, because of limitations placed on wheel diameters. Nevertheless, many variations may be obtained within this framework; larger wheels remove more stock; smaller wheels grind smoother finishes. Thinner wheels run faster; thicker wheels are more durable.

Wheel shapes, too, help solve peculiar grinding problems. A worker, having to grind a metal filled hole, need only remove his straight wheel, add a cone shaped wheel, adjust speed, and continue work.

Speeds play a large part in wheel selection. Excessive speeds break wheels; running too slow is inefficient.

To avoid operating above safe levels, manufacturers stamp maximum speed on each wheel. *These speeds must never be exceeded.* Maximum speed of a wheel, incidentally, is usually not its most efficient speed.

As a wheel wears away, its sfpm speed decreases. This means it will not be working at peak efficiency. In order to compensate for this, increase the machine's revolutions per minute until normal edge speeds are again reached. *But never exceed specified wheel speeds.*

Condition of Machine

Since speeds may vary from wheel to wheel and job to job, readers are advised to consult manufacturer's recommendations for proper speeds to be used in grinding various metals.

Grinding machines, like all other machines, lose their effectiveness with age. This must be kept in mind when choosing a wheel.

Loose spindles and insecure bearings on a grinding machine call for harder wheels than would ordinarily be used with a new machine.

Inevitably, the human factor also affects wheel choice. If workmen are inexperienced, costs will rise. Expenses for offhand grinding (work that does not require precision) can vary as much as 100% from man to man during a single day's work.

What does this all mean to the abrasive user?

Now let's take all these factors concerning wheel choice and apply them to a job.

Our job, let us say, calls for finishing several welds under a locomotive frame. The weld area—which is almost inaccessible — must then be painted. A carbon alloy steel is the material we are working with.

A floor grinding machine can be immediately eliminated — neither grinder nor weldment is readily movable. We can disregard a swing-frame grinder at the same time because of the awkward weld angle.

Our choice is a portable grinding machine, because it allows us to reach the weld easily.

Since carbon steel is a high tensile material, we select aluminum oxide as our abrasive.

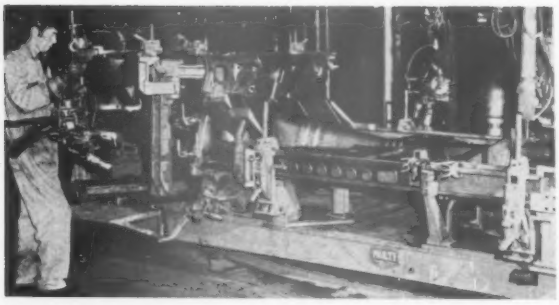
The joints have been over-welded and considerable stock must be removed. Because of this, plus awkwardness of the position, our best choice is a cone-shaped, vitrified-bonded wheel.

The cone wheel selected is 2 in. in diameter. Our portable machine runs at 7,500 rpm; therefore, the sfpm—a catalogue tells us— will be 4,000, well within the limits of vitrified-bonded wheels.

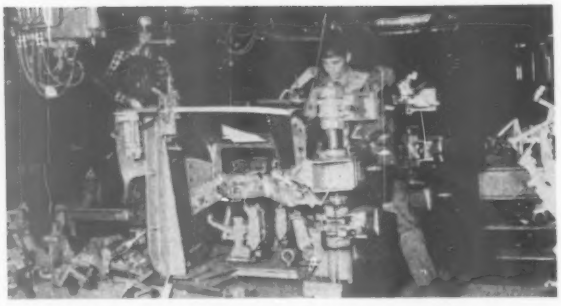
Grain size will be 24 (fairly coarse to medium), which will help remove stock quickly and in quantity. Grade will be "Q." This grade is hard and will help the grains to bite deeply into the weld metal. Structure will be an open "10" to assist grain cutting action.

Having obtained a wheel fitting our specifications, we attach it to the grinder, let it run for a minute to observe any possible malfunction, then apply it to the weld. A few moments later, the weld has been ground, finished, and is ready for paint.

AFTER this stainless steel unit was welded and ground, a worker adds a high, commercial finish with a buffing wheel installed on a portable grinder. Desired types of finishes can be obtained by wheel choice: a vitrified-bonded wheel gives a finish suitable for holding paint, a rubber-bonded wheel supplies a very smooth finish. In fact, this worker probably made his first finish passes with a rubber-bonded wheel.



READYING his spot welding gun, weldor prepares to board carousel as fixtured underbody assembly moves slowly past his station. Weldors have only seconds to complete work on each assembly.



ON board carousel, this weldor knows precisely where to make welds and how many are needed. Suspended gun-type spot welders, rated at 75 or 150 kva, allow him to move several feet before hopping off.

In these days of sky-high manufacturing costs, major model changes in the automotive industry are not made frequently or with abandon. That's one reason why Lincoln's all-new 1958 models with unitized body construction are raising many an eyebrow.

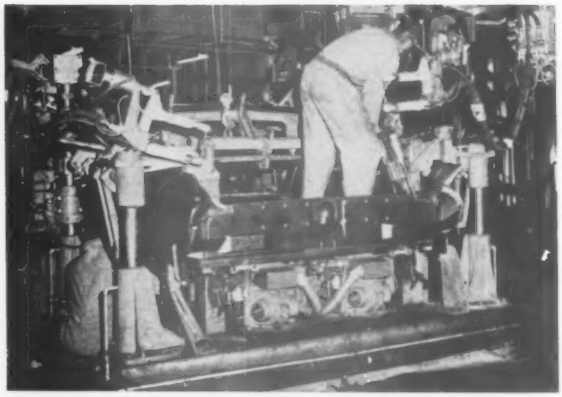
Moving ahead with welding, Lincoln unitizes 1958 models

By Jack Fairlie

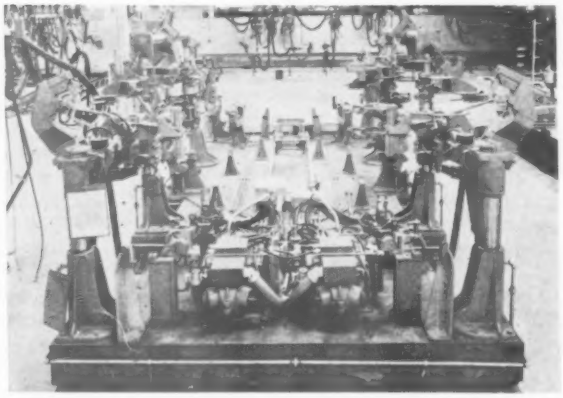
UNITIZED, ALL-WELDED auto bodies—not a new idea, but a good one for greater strength and fewer production problems—are a distinctive feature of 1958 Continental and Lincoln models introduced on November 1 by Ford Motor Co.

Approximately 9,850 resistance spot welds (plus numerous manual arc and oxyacetylene welds) tie-in underbodies, sides and roof panels to give the new Lincolns and Continentals a sound, rattle-free advantage over other entrants in the fine-car field.

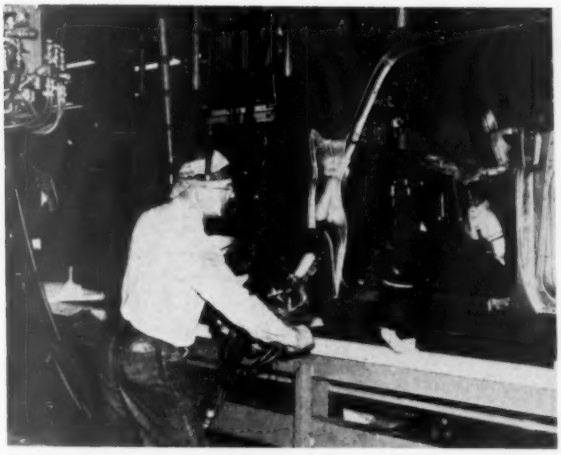
But behind the vital production-line welding operations lies the story of another type of construction: that of



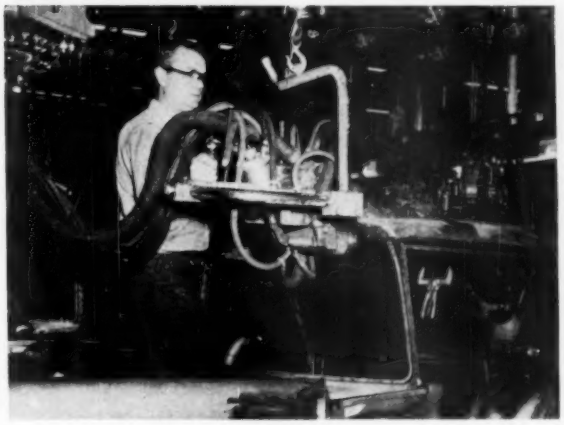
SIDE and underbody units, together with front fenders, roof and package tray, are spot welded together on one of six giant fixtures. Total loading, welding and unloading time is just over 7 minutes.



BODY shells taken from fixtures like one at left are occasionally placed in master fixture above. If fit is not precise, fixture from which shell came is thoroughly inspected and fault corrected.



LEFT: Only four areas on body shells need further spot welding once shells leave large fixtures. This is done on finish-weld line.



RIGHT: One of two roller spot welders at Lincoln plant joins flanged drip moldings to roof edges. Unit makes three welds per inch

Lincoln's new assembly plant.

Located on a 325-acre tract in Wixom, Mich. (28 miles northwest of Detroit), Lincoln's modern production set-up was designed with the express intent of facilitating its current method of welded auto fabrication. With equipment installation completed during the summer, the plant turned out its first '58 auto on August 1—right on schedule.

Though it is once again paired with Mercury as a division of Ford Motor Co., Lincoln is now capable of filling all domestic and foreign orders from this one assembly plant. Prior to plant completion, the firm had relied to some extent on Mercury's production facilities.

Throughout the 1,374,000 sq ft of floor space at the Wixom installation, all production equipment is modern and fumes, dirt or crowded working conditions are non-existent. (Though the latter three factors are conspicuous by their absence in the bustle of assembly-line operations, their omission is no accident. Actually, they were planned *out* for greater employee safety during the initial design, layout and equipping of the plant.)

First for Ford

Lincoln is now producing the first automobile with unitized body construction in the history of Ford Motor Co. But this "first" for Ford is a "second" in terms of the entire automotive industry (American Motors Corp. produces models with partially unitized bodies), and it is actually a "second" for Lincoln itself.

Back in 1934, the company pioneered the concept of unit-body construction. The much-discussed result of their efforts was the "Zephyr" model that remained in the Lincoln line until 1942.

But this fact alone—that unitized construction has been an automotive "in-and-outer"—is undoubtedly going to be a major topic for discussion among well-informed shoppers who might also be potential Lincoln purchasers. If the advantages of a unit body are so remarkable from a manufacturer's point of view, they will ask, why hasn't this construction method achieved more widespread application?

The answer is found, not in pro's and con's concerning the unit-body method itself, but in the evolution of the joining process that makes it feasible—resistance welding.

A Manufacturer's Advantage

The unitized body is, after all, of importance principally to the manufacturer. It is not an automotive form with the broad advertising appeal of swept-wing fenders, for example, or power brakes, steering and windows. In fact, it is scarcely, if ever, cited in advertisements by manufacturers employing the method.

Unit bodies, in a word, are *economical*. Components do not have to be drilled for bolts or rivets, and the *oneness* of chassis, frame and fenders enables the manufacturer to paint all body panels (except the hood) with standard body paint equipment. Overall paint quality is notably improved, and costs are obviously cut.

Lincoln's initial efforts to achieve these economies in the mid-30's met with some success. But welding was still a relative newcomer to the metal-joining field, and the firm missed the impact of today's powerfully accurate, high-speed spot welders.

In the topsy-turvy, "25-hour" days endured by manufacturers during World War II, welding matured with a rush. The glimmerings of resistance welding's potential industrial value—in particular—burst into a strong, full-bodied gleam.

At Lincoln today, there are no misgivings over the ability of this joining process to send a full array of economically-constructed autos onto the commercial battlefield of the fine-car market. And there is a healthy confidence, too, in the capacity of its several models to eventually sweep the field.

Not-So-Merry-Go-Rounds

Two of Lincoln's major assembly areas—the underbody and sidebody fabrication setups—are ovate in shape. The manner in which fixtured parts circle under suspended gun-type spot welders—and the way in which weldors must step on and off the moving assemblies in the performance of their job—has naturally led to the

APPROXIMATELY 165 assembly in. of arc welds are made by 8 weldors as body shells pass through 110-ft shed. Electrode is 5/32-in. E6012.

designation of these set-ups as *carousels.*

There is nothing particularly merry in the merry-go-round appearance of these areas, however. Weldors at each station on the carousel literally have only seconds in which to complete their portion of total welds to be made. They must then hop off, swing their spot welding guns back a few feet, and begin anew on another assembly moving down the line.

But within this mechanical jungle, and in spite of the speed at which all workers must operate, there is remarkable order. On platforms high above each carousel are mounted all necessary control panels for the welding machines suspended below. Such overhead installations save heavily on valuable floor space.

On the underbody carousel, these controls insure the accurate operation of 39 gun-type spot welders on 30 assemblies per hour. Some of these are 75-kva units; others are rated at 150 kva. (Only spot welders with these two power ratings are used by Lincoln).

Steel parts to be welded—including the motor support side members, motor mount, cross members and floor pans—range in thickness from 0.036 to 0.090 in. and are fitted in 10 fixtures.

All But Four

The sidebody carousel is comprised of five sets of fixtures and 20 spot welders. On this almost-circular line all parts and sub-assemblies for the body sides are completely welded together.

As under- and sidebody units are completed, they are removed from their fixtures, placed on a moving track and carried just a few yards to a line of six giant fixtures.

These are the keys to Lincoln's production accuracy. Pneumatically operated, they clamp—and securely hold—underbodies, body sides, front fenders, roof and package tray. They are massively complex, yet body components can be loaded on them, spot welded and removed as a unit in just a little over 7 minutes.

And so cleverly constructed are these fixtures (and those on the carousels) that only four areas need the brief attention of an operator and his spot welder in a later swing down the "finish-weld" line.

At regular intervals, basic unit-body assemblies leaving each of the giant fixtures is swung by overhead crane onto a nearby floor area where the master fixture has been mounted.

Testing Procedures

When placed in this master unit and clamped, bodies must fit precisely. If the fit is not exact, operations are shut down on the particular production fixture from which the body came until accuracy is once more assured.

All of the spot welding guns used on the under- and sidebody carousels, as well as those surrounding the general-assembly fixtures, are also subjected to a regular test procedure.

The guns must weld test coupons cut from the same stock to which they are normally applied. If a peel test indicates a sound weld nugget, the torn coupon is marked "OK", dated and hung on a wire attached to the gun which made the weld.

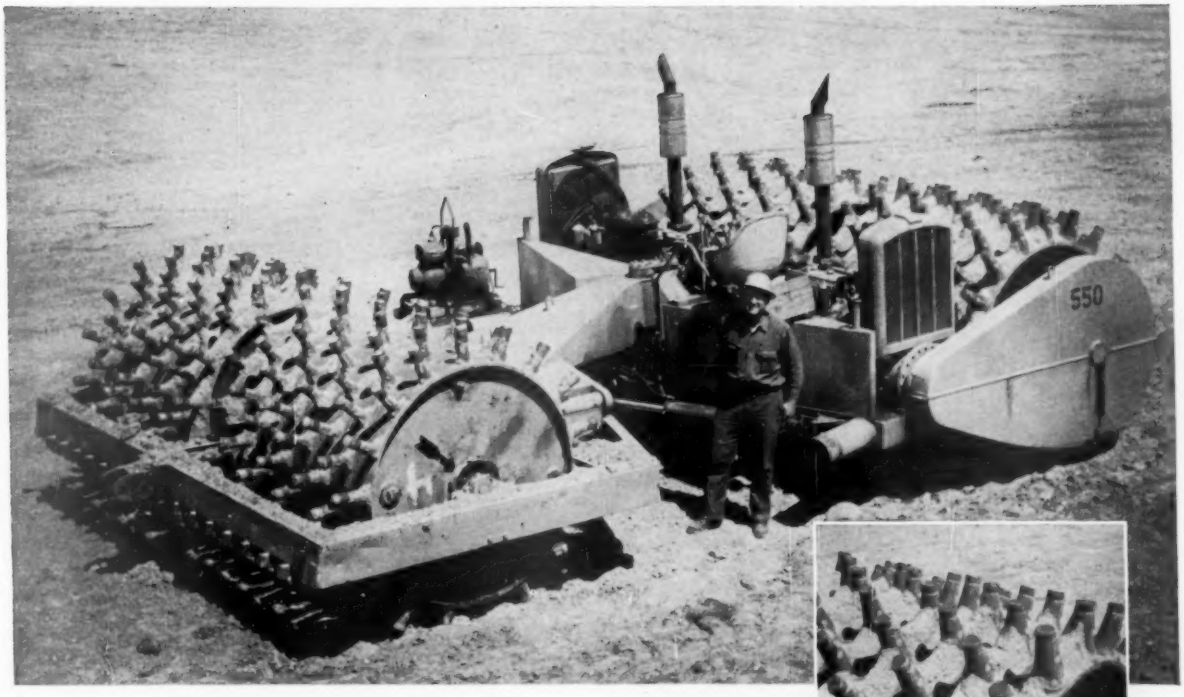
Roller Spot Welding

Roofs spot welded to bodies in the six large fixtures do not have their flanged drip moldings completely attached. This operation—which would be too time consuming if handled by single-spot guns—is performed by two roller spot welders.

Though technically spot welders, these units have circular electrodes and operate much like seam welders. The difference lies in the fact that welds do not overlap. The units are set to make three welds per inch along the entire length of the roof flange.

As bodies leave this last major resistance welding area,

GRINDERS work in fume-exhausted shed and wear recommended safety devices while smoothing arc and gas-welded areas, or any other rough spots on surface of body shell.



MORE SPEED WITH NEW COMPACTOR

Conventional compactors are not fast enough for the Mittry Construction Co. —so this firm designed and built the double drum monster shown above on a job in Santa Maria, California. Two 200 H.P. diesels drive the machine through torque converters at a speed up to 8 m.p.h.; hydraulic rams operate the steering mechanism. Bare weight is 75,000 pounds; with ballast, 100,000 pounds. This compactor is now doing the work of three ordinary pieces of equipment.

Since speed is the basic reason for this new machine, every factor that keeps it on the job and reduces down-time for repair or parts replacement has been given close consideration. For example, tamper feet might be expected to wear rapidly at high operating speeds; to cut such wear to a minimum the feet were treated to a band of Stoody 121 applied by the semi-automatic welder before the machine went into service. The inset photo above illustrates the appearance of the feet as hard-faced. There will be little "time out" for replacements here!

And on the subject of getting the most out of sheepsfoot tampers—here are two other commonly used methods of restoring worn feet. Both are illustrated at the right. The first method uses short lengths of pipe driven over the worn ends, the "cups" then being filled with deposits of Stoody 121 applied by the semi-automatic welder. This method of weld casting is extremely fast and the ring restores both size and height of the foot. On square shanks the ring may be welded first to close the bottom opening. This method has the advantage of saving time in removing the tamps from the machine.

The second procedure is the use of a split mold, either copper or carbon. The cavity above the stem approximates the original size and shape so the weldor simply fills in with Stoody 121. Gauge is restored automatically. Both methods provide far longer service life at very considerable savings.

The Stoody Guidebook covers hard-facing procedures for all types of heavy equipment. See your Stoody dealer (check the "Yellow Pages" of your phone book) or write direct to the company for a free copy.

Feet are kept out-to-size and with square edges by a single bead of Stoody 121 applied around the perimeter.

Fast repairs result without removing tamps from the machine by driving cups over the worn ends and filling with Stoody 121.

The carbon or copper split-mold surrounds the tamper and forms a cavity which is filled with Stoody 121 by the semi-automatic process.

STOODY COMPANY

11984 East Slauson Avenue • Whittier, California

READY to roll . . . these 1958 Lincolns are being given a final tune-up and thorough inspection before moving onto auto transport trucks that carry them to all parts of the country.

they are placed on a floor-level chain conveyor which carries them into the first of two long sheet-metal sheds.

In this first shed are 8 manual arc weldors. It is their job—and that of the gas weldors working outside at the far end of the shed—to deposit weld metal on certain seams which could not possibly be reached by standard gun-type spot welders.

Using 5/32-in.-diameter E6012 electrodes, these men make approximately 165 assembly in. of arc welds on 12 areas in the brief time it takes a body to move through the 110-ft-long shed.

Weldors in this shed, incidentally, benefit from a remarkable fume exhaustion set-up. Although exhaust ducts are not apparent, smoke and fumes from 8 arcs is swept away before it can obscure vision or create a potential respiratory problem.

End of Welding Line

Upon leaving the arc welding shed, bodies are set upon by numerous gas weldors who apply both mild steel and brass alloy wires in touch-up welds on a few areas too small to warrant an arc welding application. Oxyacetylene is the gas used for this welding operation.

In line with plant safety procedures, acetylene is stored outside the plant in a special building. Initially, 24 cylinders have been manifolded in the acetylene house for all-plant use. When the need arises, however, an additional 16 cylinders can be hooked-up. Cylinders have a 275-cu-ft capacity.

The oxygen supply also is stored outside the assembly building, and a bank of 162 cylinders are manifolded. An additional 18 cylinders constitutes a reserve supply. All oxygen cylinders are regularly refilled from a vendor's tank truck.

Approximately 4,000 ft of pipe deliver oxygen and acetylene from their storage areas to strategic locations in the plant. The gases are tapped for use at 8 work stations on the production line.

Chain-operated shut-off valves have been installed at several locations in the plant so that gas flow may be cut off in an emergency. For further safety, there are flash-back arrestors at each main branch, and at the point where the pipeline enters the plant.

Finished Product

The completion of gas welding marks—in almost every instance—the last welding application which Lincoln auto bodies receive. Exceptions to this are found occasionally by sharp-eyed inspectors who may call for additional welds. Two spot welding guns are retained at the end of the welding line for just such an emergency.

The bodies that have received their full quota of welds then pass through a grinding shed—similar to the one housing arc weldors—where deposited weld metal and all other edges requiring deburring are ground smooth. (Lincoln's emphasis on safety is once again apparent in this grinding shed, where air exhaustion and the use of filter masks prevent grinders from inhaling fine metal particles.)

From the body fabrication area, unitized body shells are processed through the myriad operations necessary to outfit them for appearance, performance and comfort.

Repaying Their Cost

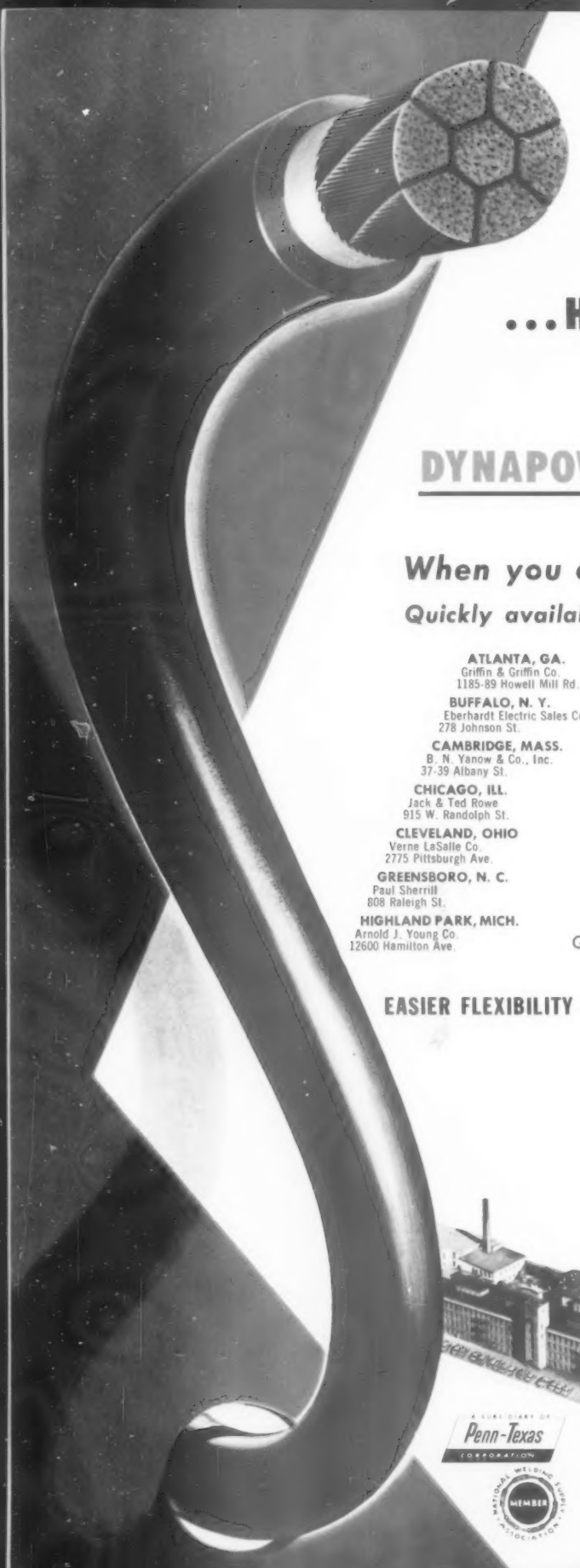
Apparently in agreement with the observation of one automotive industry official that ". . . the medium-priced car market has gone to hell," Lincoln is shedding a decade-long pretense that its $5,000 to well over $6,000 models could be construed as "medium-priced."

But in this market transition, economy-mindedness developed during years of sales campaigning against Oldsmobile, Buick and its "off-again, on-again" corporate partner, Mercury, hasn't been lost. The art of keeping production costs down, in fact, seems definitely to be on the upswing.

Resistance welding—and the arc and gas processes that round-out each body shell—will take a giant step during the coming year toward repaying their installation costs.

And, in the process, they can turn out—on a straight-time, two-shift basis—112,000 Lincoln automobiles, unless market conditions indicate an upward or downward revision in this production rate.

ASK THE MAN BEHIND THE GLOVE...
CAROL AWG 4/O NEOPRENE WELDING CABLE
CAROL AWG 4/O NEOPRENE WELDING CABLE



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WORKER using micrometer to insure accuracy on wheel after having removed it from press.

WOMEN preparing mounted wheels. Such small wheels are used to grind hard-to-reach areas.

This visit proves . . .

Quality control vital for grinding wheels

By F. W. Foerste

"HERE," our guide said, pointing to a large kettle, "here we keep some of the abrasives used in manufacturing our grinding wheels. This particular kettle contains silicon carbide and feldspar. We'll use that when we make a vitrified-bonded grinding wheel."

The place was Chicago Wheel & Mfg. Co. and our companion was an executive of the firm. We had requested a tour through the plant to see how all the factors which must be included in a grinding wheel were put together. At the moment, we were standing inside a room filled with presses.

Molding Wheels

"Notice how cool it is in here?" he went on. "That's because we keep this room air-conditioned. Too much moisture in the air would enter the mixture and weaken the bond.

"Like other wheel manufacturers, we're always striving for a precisely made product. One way we attain this precision is by material control. That is, by varying the ratio of bond to abrasive, we can get the kind of wheel we want. If we use a great deal of bond to the proportion of abrasive grains, for instance, we get a hard wheel with an open structure.

"But if we use less bond to the same proportion of abrasive, our wheel is what we call soft. A soft wheel, because it has less bond, lets grains peel off faster than a hard wheel. This being the case, you get new layers of abrasives as the dull ones break off—a good condition when you're working with high tensile metals.

"Naturally, we can control grain sizes as well to vary the wheel's cutting action."

We walked to one of the presses where a worker was filling a mold with an abrasive-bond mixture which, to us, looked very much like rough, moist sand. After he had smoothed away excess material, he covered the mold and slid it under the jaws of the press.

"How much pressure is put on the wheel to bond it?" we asked.

"This press delivers 1,200 lbs per square inch (psi). That much pressure on the moistened mixture will pack it solidly enough that we can handle it later without having it crumble away. Actually, though, this process doesn't bond the wheel. You'll see that later when we visit the kilns."

Precision Measurements

Slowly the press opened. Slipping the mold out, the worker extracted the now-solid wheel and measured it with a micrometer. We asked why the instrument was used at this point.

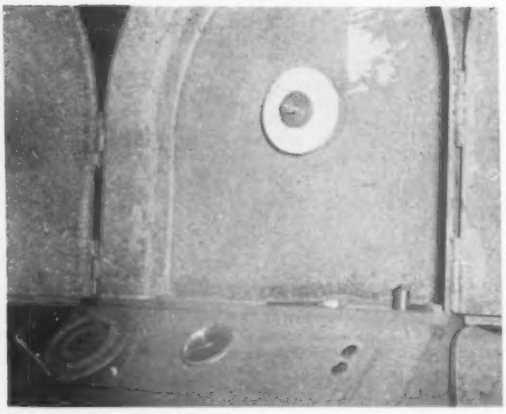
"Well," he laughed, "the best place to start being sure of your product is at the beginning. That's why he's 'mikeing' the wheel. By maintaining close tolerances at this point, we can save a lot of work later. Come on, we'll take a look at those kilns now.

"I really should say kilns and ovens" he said, as we walked around a line of employees waiting for Asiatic flu shots, "because even though vitrified wheels are bonded in kilns, resinoid wheels, which we also make, are bonded in electric ovens.

"Before a vitrified wheel is placed in a kiln, it is thoroughly dried with infra-red rays. That removes any moisture which might hinder bonding.

"The purpose of the kiln is to convert the feldspar into a glassy mass. This mass will hold abrasive grains firmly in place. A lot of heat is necessary for the job, and we fire wheels at 2,600 F for several days.

"Since we work only one shift here, we've installed this electrically



WHEEL about to be tested at a speed 50% faster than its safe maximum. Doors close to protect testers in case of breakage.

operated temperature control to act as our watchdog." He led us to a chart which was registering temperature within the kiln. "That gage records all temperatures, day and night. During the day, of course, our regular personnel check. At night, our watchman looks in on it every time he makes his rounds, so we're always able to know how the wheels are firing.

"Once a wheel has been bonded, it's tough and durable. But it isn't ready yet to be put on a grinding machine. No, there's still a lot of finishing and testing to be done before it reaches that stage.

Additional Work

"For one thing, the wheel isn't down to correct size, nor has it been trued and balanced. To do those jobs, we use carbide and diamond cutting tools. Wheels are put on lathes and machinists trim them to size, on the OD and, if necessary, on the ID.

"Look at this vitrified-bonded wheel," he stepped to a bin and brought out a cup wheel, "it may look all right to you and, for all general purposes, it is. It's naturally rigid and really does a good cutting job. Trouble is . . . it's too rigid. Let an operator shove a piece of stock at it a trifle too hard . . . snap, one broken wheel.

"We solve that one by putting in a steel bushing. Once the bushing is seated, it takes a lot of shock to break a wheel. Of course, when the wheel is mounted on the machine, flanges will take up a lot more of the shock . . . but, if you've seen everything you want in here, let's visit the testing room."

Passing through several more corridors, we entered a spacious, airy section where a number of women were attaching tiny cup wheels to equally small steel mandrels. They were making mounted wheels, we knew, but we had never seen such small ones before. We stopped to watch them make the fit.

Standing with us as we looked, our guide said, "Interesting, isn't it? To my mind, these small wheels are one of the best things the grinding wheel industry has developed. These little cups can get inside the darndest places you ever saw."

Wheel Testing

"Just how long a life does the average grinding wheel have?" we asked him. "Do they wear out quickly or do they last for quite some time?"

"Wheel life is usually dependent upon the amount of use a wheel gets. I would say that, with normal care and use, a wheel in a shop that does much grinding will last from two weeks to a month. High production work, of course, is another matter. There, a wheel is worn out in a few hours. Naturally, the kind of material that is ground has much to do with wheel wear.

"Well, let's get on to our testing room, and while we walk, I'll tell you a little about our testing methods. In the first place, the way we test is the way the whole grinding wheel industry tests, at least all our standards are the same. In testing—and in safety matters—we're guided by the American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels.

"Since almost all grinding wheel manufacturers are members of the Grinding Wheel Institute, which sponsors the code, anyone who uses a wheel can be reasonably sure *his* wheel meets *our* standards.

"The point all of us are concerned about most," he went on, "is modulus of rupture. Don't let the term confuse you, modulus of rupture is simply a technical label for wheel breakage. Wheel breakage is both costly and dangerous. So we run some stiff tests to make sure our wheels never reach that point.

"Naturally, we test a number of other wheel factors as well, like grade, the force necessary to penetrate the bond, vibration frequency and so on. Some tests are conducted mechanically; some are conducted visually.

"For example: if we find a wheel substandard in hardness—out it goes. Or, if a wheel face is chipped, it is rejected too. We don't want one inferior wheel going out of the factory."

We had, by now, arrived at the testing room. A rather small chamber, it was dominated by a huge, boxlike cabinet.

"This is where our larger wheels get their toughest test. Every wheel over six inches in diameter has to be checked out at a speed fifty percent faster than it will ever run on a job. So, if a wheel was designed for 10,000 surface feet per minute, it's put on this machine at 15,000 sfpm. When a wheel can take *that* much punishment, it ought to be pretty safe on the job.

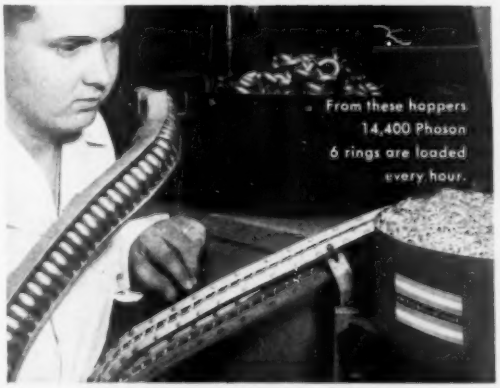
"Except for stamping on a wheel's specification, safe maximum speed and packing it, that's all. But, as you can see, making a grinding wheel is no haphazard process."

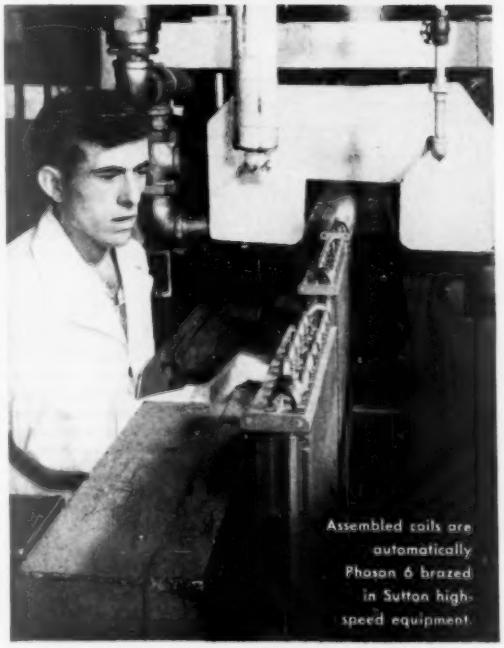
And we couldn't have agreed more.

"No—that was 'Way Down Upon the Swanee River' . . . now try and guess this one!"

UNITED PHOSON 6 MAKES AUTOMATION IN BRAZING PRACTICAL... HIGHLY PROFITABLE

Brazing, too, can be fully automated. With the equipment shown, brilliantly engineered by The O. A. Sutton Corporation, up to 14,400 brazing rings are loaded every hour. Thanks to the high quality and precision tolerances of Phoson 6 rings, this company, one of the world's leading manufacturers of comfort cooling appliances, has increased assembly speed of copper return bends by 12 times!





To permit this amazing speed, brazing rings must fit tightly — perfectly — completely eliminating slippage prior to brazing. Here's how United Phoson 6 rings meet all the strict precision requirements of automation:

FIRST . . . Rings of Phoson 6 are preformed to exacting and uniform tolerance of +.000″ to −.005″ ID with a maximum helix of .015″.

SECOND . . . at the lowest practical temperature, Phoson 6 brazes leakproof joints of highest strength, ductility, corrosion resistance and thermal conductivity.

These two points add up to one fact. You can profit now from automated brazing! Without delay, get the whole story. Write direct to United or see your nearby United Welding Supply Distributor.

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He'll tell you that lightweight KW welding cable is easier to lift . . . easier to drag around.

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And, for more energy left after a day's work, he'll tell you KW's light weight helps plenty!

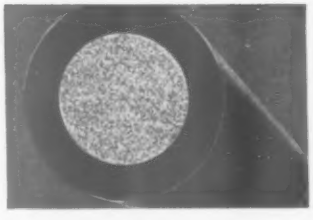
Then . . . compare KW's price and ask YOURSELF this question: "Isn't KW aluminum welding cable the most practical answer of all for MY welding cable problems?"

KW welding cable is produced for equipment manufacturers by Kaiser Aluminum at the company's Newark, Ohio wire and cable mill. For complete information, contact your welding equipment manufacturer or supplier.

Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Building, Oakland 12, California; *General Sales Office*, Palmolive Building, Chicago 11, Illinois.

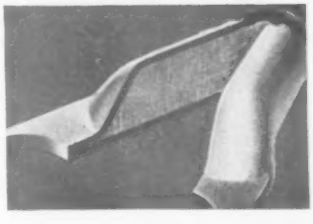
Yet that's only part of the story . . .

FLEXIBLE to make work easier! KW cable is so flexible that it can easily be looped with thumb and forefinger. The fine aluminum wires used assure maximum flexibility—plus toughness and long-life durability.



DURABLE to withstand hard use! KW's tough GRS rubber jacket resists abrasion, acids, sunlight and heat. For extremely hard usage, KW's fireproof neoprene jacket offers maximum resistance to abrasion, acids, alkalies, grease, oil, sunlight, heat.

RUNS FAR COOLER! Aluminum dissipates heat faster than copper cable of equivalent size. As a result, an aluminum cable is cooler and more comfortable to handle.



EASY TO SOLDER to make good connections! Both soldered and mechanical connections are simple to make with KW aluminum welding cable—whether aluminum to aluminum or aluminum to copper in cables, terminals and accessories.

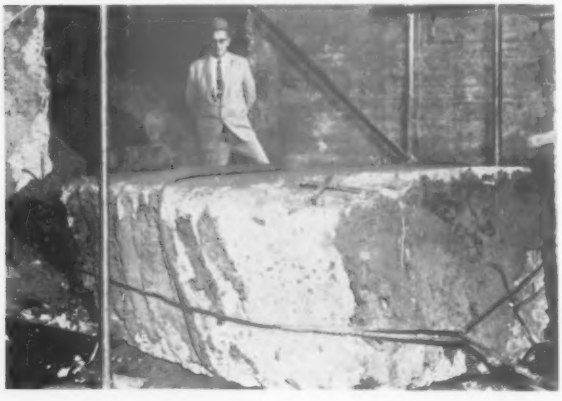
Kaiser Aluminum

IF IT CARRIES CURRENT, ~~WE~~ CARRIES IT!

LIVE BETTER ELECTRICALLY

OPERATOR begins 20-ft horizontal cut after completing 16-ft vertical cut (*dark line at left*). Concrete wall is 4 ft thick and cutting speed is 1½ ft per hour.

ABOVE: Operator dresses for safety with hardhat, goggles with shaded lenses, face shield, aluminized apron and heavy gloves. He is attaching black iron pipe to handle of powder-lance unit. BELOW: Chunk of 3-ft-thick inner wall has been cut by powder lance. G-E supervisor Richard Bartlett views 18-ton section.



Apply the powerful powder-lancing process . . .

And the walls come tumbling down!

A MODIFICATION of the powder-cutting process introduced by Linde Co. in 1943 for use on stainless steel is currently demolishing thick concrete walls at General Electric Co.'s general engineering lab in Schenectady, N. Y.

The relatively new process is called powder-lancing, and is widely used in the steel industry to make shot-holes in slag pockets which gather in open-hearth furnaces. Equipment is simple; the lance is manually operated and consists of a handle to which is attached one or more lengths of black iron pipe.

Iron and aluminum powder is fed pneumatically into the lance handle, where it is mixed with oxygen. The burning particles are then carried through the pipe to bombard and melt concrete. Theoretically, there is no limit to the depth of a powder lance's cut; clean cuts in 12-ft-thick concrete have already been made.

The G-E job is being handled by James E. Lowe & Sons of Schenectady, and entails the removal of 8,000 cu ft of concrete. Most of this material was molded into safety walls up to 4 ft thick. They formed a pit for testing high-speed steam turbines.

This pit, along with other portions of the building which housed it, must be razed to make room for a $1,000,000 radiation laboratory scheduled for completion in 1958.

Hexagonal in shape, the pit consists of two concrete walls separated by 6 ft of packed sand. The inner wall is 3 ft thick; the outer, 4 ft thick. Both walls are approximately 16 ft high.

The cutting lance, manufactured by Linde, is slicing these walls into 16 by 20-ft sections weighing up to 18 tons apiece. Cutting speed is about 1½ ft per hour. Severed sections are hoisted out of the pit by a 100-ton bridge crane.

According to H. N. Lowe, president of Lowe & Sons, the job is nearing completion. It was begun 6 weeks ago. By the time work is ended, Lowe estimates, 20,000 lb of iron powder; 6,000 lb of aluminum powder; 8,000 ft of iron pipe, and 450,000 cu ft of oxygen will have been consumed.

Sound like an expensive proposition? Lowe says *no*, and states that the powder-lancing method will save G-E approximately 30 to 40% over probable charges for mechanical demolition.

For the first 10 months (regular issues) of 1957

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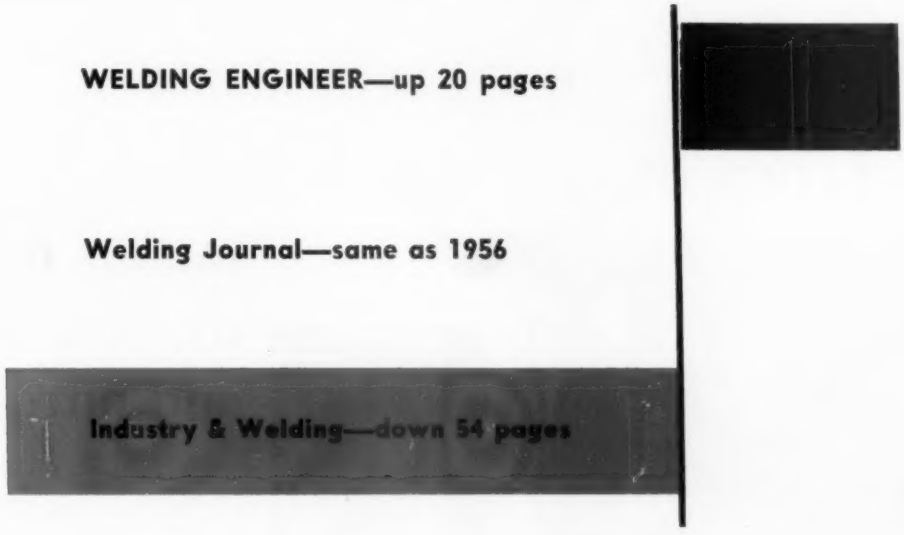

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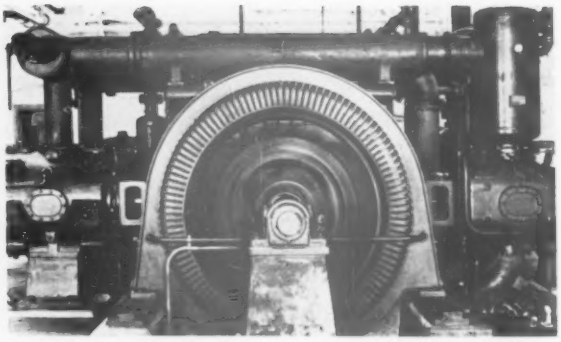
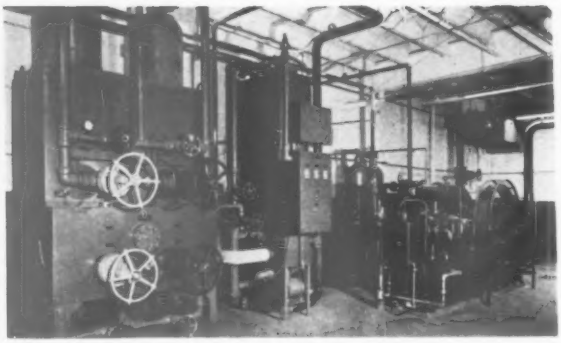


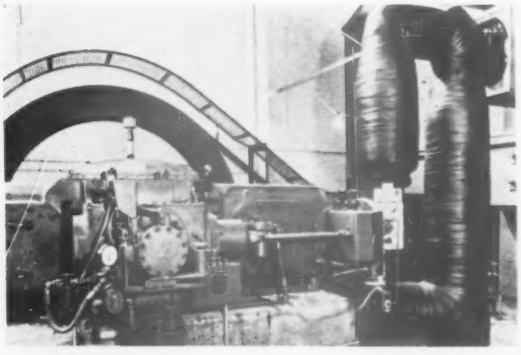
RAW material, air, is forced into this multi-stage compressor where it passes through five separate pressure stages until it is reduced to 2,850 psi. Between 2nd and 3rd stages CO_2 is removed in two "caustic scrubbers."



AIR, cooled by inter-coolers between compression stages, goes to these controlled driers where air is dried and purified. Process is based on the fact that air, if correctly subjected to cold and pressure, will convert to a liquid.

From the air you breathe...

comes liquid oxygen, argon and nitrogen

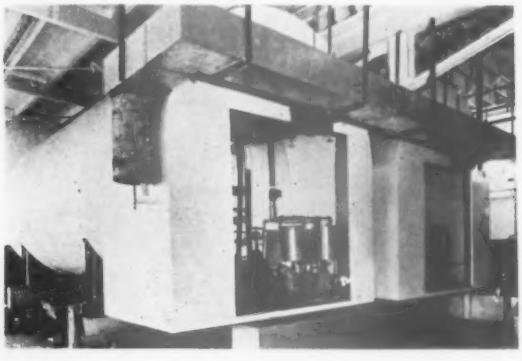


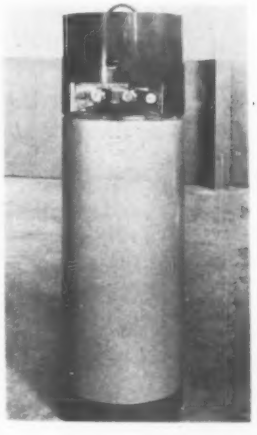
POWERFUL expansion engine reduces air pressure from 2,850 psi to 65 psi, causing a temperature drop from —38 F to —140 F. After going through an exchanger, the air becomes a liquid.

IN this fractional distillation tower, liquid air is separated into oxygen, nitrogen and argon. The process takes advantage of the fact that gases can be separated at their different boiling points.

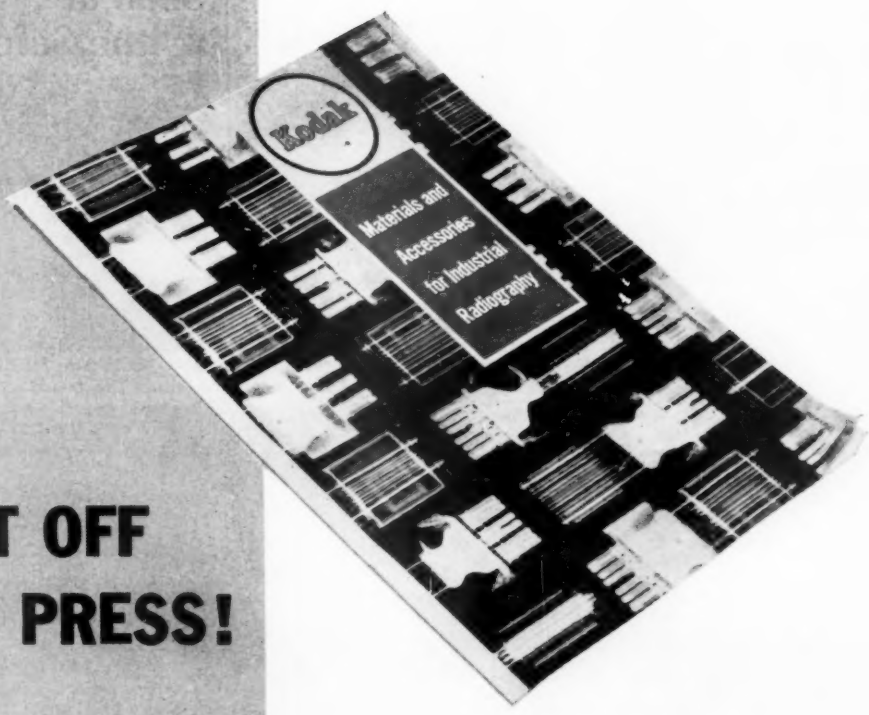
A streamlined, glass and steel building near Cleveland's lake shore houses the latest equipment for producing liquid oxygen, nitrogen and argon. Burdett Oxygen Co. built the plant after months of research, including a visit to Germany to study famous chemical centers. In the past five years industrial gas consumption has doubled. Since gaseous oxygen has 862 times the volume of its liquid counterpart, the economy of liquid oxygen can be summed up in one word—space.

LIQUID oxygen is stored in these giant insulated tanks which control the sub-zero temperature. Each container stores the equivalent of 1,500,000 cu ft of oxygen gas.





SPECIALLY developed liquid oxygen cylinder for users has one cylinder inside the other. Single container holds 3,000 cu ft of liquid oxygen. Over a million dollars worth of equipment at the Burdett plant turns out liquid and gaseous oxygen, nitrogen and argon.



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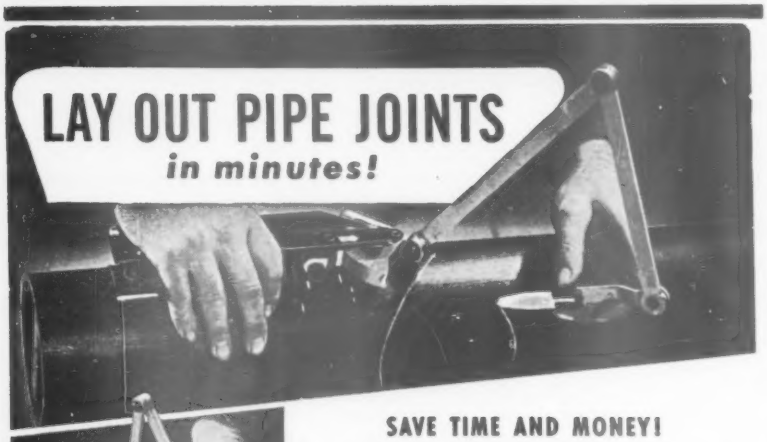

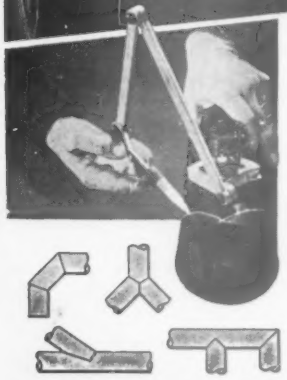

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THE CONTOUR MARKER

Seen at the Safety show

MRS. ILLINOIS, Phyllis Rouse, helped decorate the booth of Sellstrom Mfg. Co., Palatine, Ill., at the National Safety Congress held Oct. 21 to 25, in Chicago. *WE* reporters toured the once-a-year affair.

HELMETS, goggles and other safety equipment were displayed by Welsh Mfg. Co., Providence, R. I. About 13,000 persons saw the safety show at Chicago's Conrad Hilton.

AMERICAN Optical Co.'s booth drew many spectators. The Southbridge, Mass., firm displayed its eye safety equipment.

PAUL Frommelt, Jr., told us about Frommelt Industries' portable weld shield. The Dubuque, Ia., firm was one of 186 exhibitors at the show.

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- Maintains arc stability through the complete current range from extremely low to extremely high without range switches.
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- Low spatter performance on special electrodes.

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Write for complete information on this equipment and for other high quality—high performance welding machines under development.

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DRAMATIC is the word for this architect's sketch of transparent elevator being propelled toward hotel's rooftop cafe by all-welded ram. Neon "stars" in many colors glamorize night-time operations.

Put this San Diego hotel on your itinerary if you want . . .

A thrilling ride on a welded ram

By J. B. McCormick
District Engineer
Lincoln Electric Co.

CLIMBING the 15-story facade of San Diego's plush El Cortez Hotel is an unique elevator—enclosed in plexiglass and propelled by a 160-ft all-welded electrohydraulic ram.

The installation was a major part of the hotel's recent $2,000,000 modernization program. It moves up to 16 passengers from ground level to a rooftop cafe at a speed of 200 fpm. The trip takes 48 seconds.

8 Casing Sections

Comprising the elevator ram are eight 20-ft sections of 14-in.-diameter steel casing with wall thickness of approximately ¾ in. Ends of the casing sections were beveled 30 deg, and had small upset lips 3/16 in. wide which protruded about 1/16 in. from the surface.

When sections were butted together, a 60-deg included angle was formed at the joint, and the lips provided a backing to prevent undercut. As shown in the sketch of a typical joint, sections were held firmly by an inside threaded coupling about 14 in. long and with a ¾-in. wall.

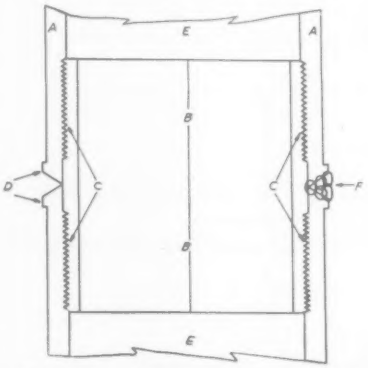
Welds on the casing included five stringer passes, which were laid down manually and gave 100% penetration through the casing and into the coupling.

Iron-Powder Welds

The first pass was made with an E6010 electrode. The remaining passes were made with an all-position iron-powder electrode (*the proposed E6014*—Ed.). Welding current was supplied by a 200-amp portable gas engine-drive generator.

Completed welds, along with protruding lips on the casing, were ground flush. The joint was then highly polished, and the weld line cannot be easily detected.

The ram descends into a concrete-lined pit, at the base of which is the hydraulic propulsion unit. Hydraulic power is furnished by five heavy-duty pumps. Controls are electric, functioning through push-button panels in the cab and at top and bottom levels.



TYPICAL joint between casing sections. A: ¾-in. casing wall. B: coupling. C: threaded area. D: lips to prevent undercut. E: casing.

A separate control room receives impulses from the panels and, through a remote computer, transfers signals to the pump motors. An unique feature is the ability of this system to respond to floor or cab signals in an efficient sequence through an electronic memory device.

Safety and Song

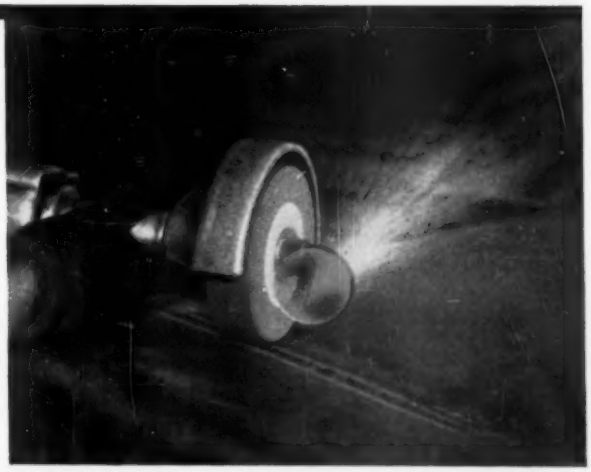
The 3,500-lb elevator cab is equipped with photoelectric safety doors, permitting passengers to face in any direction with safety during their ride. Air-conditioning and piped-in music are other luxuries.

The cab rides a pair of rails which are bolted to the internal building structure. Midway between cab and the lower end of the ram is a safety follower bracket which encircles the ram and engages rails on either side to give added lateral support.

Architects for the installation were Paderewski, Mitchell & Dean. General contractor was Glass Elevator Inc., and welding work on the ram was supervised by Joseph McLaughlin of Nucle-Arc Welding Co. All firms are in San Diego.

A great new combination for your heavy weld grinding

44 ALUNDUM abrasive and B-11 resinoid bond form precisely balanced, economy wheels that bring you "TOUCH of GOLD" advantages*



In 44 ALUNDUM abrasive you get a recent Norton development that's a big step forward in quality-plus-economy.

"44" is non-premium priced . . . it's made differently, for extreme toughness and ruggedness . . . it performs better than other non-premium priced aluminum oxide wheels, cutting faster, grinding cooler and lasting longer . . . it's job-proved in 1100 different tests made in plants, welding plants included, throughout the country.

In the new B-11 resinoid bond you get added processing advancements that step up performance-benefits in your heavy weld grinding.

B-11 wheels are more uniform in structure and better balanced . . . they "hug that work" closer, with less vibration and bounce . . . they're made to closest possible duplication, available in half-grade increments evenly spaced across the entire hardness scale.

For details on these typical "Touch of Gold" benefits that add up to lower cost weld grinding, better product appearance, less operator-fatigue and longer wheel life, contact your Norton Distributor. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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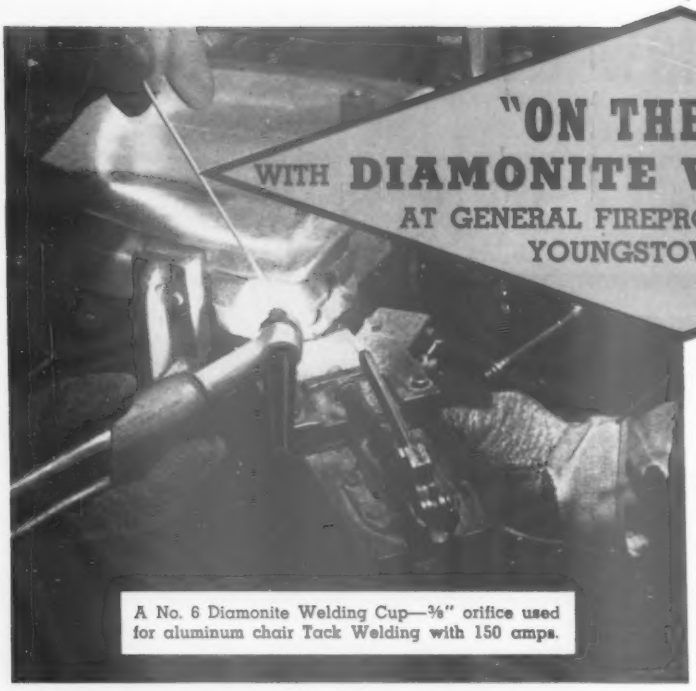

A No. 6 Diamonite Welding Cup—⅜" orifice used for aluminum chair Tack Welding with 150 amps.

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Finish welding aluminum chair using 170 amps —also a No. 6 Diamonite Welding Cup in use.

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The full line of Diamonite Welding Cup sizes for standard torches is carried by many distributors. Write for his name in your territory and the Diamonite Welding Cup bulletin.

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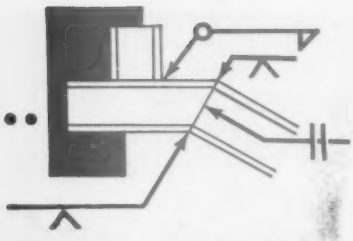


the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Magnesium has needed strength

Question:

We have seen some pretty conclusive indications of magnesium's light weight, but I would like to know if this metal is really as strong as some of its producers claim. Information on the strength of magnesium isn't as common as the data describing aluminum. Can you tell us something about this important quality?

Answer:

In its special June, 1957, issue on the Tig (tungsten inert-gas) process, WELDING ENGINEER pointed out that this highly versatile welding process was developed *specifically* to permit fabrication of magnesium. This should give you some idea of the stress that was—and still is—placed on magnesium's strength (in combination, of course, with its light weight).

As you know, Tig is now applied to a multitude of different metals, but it is still favored whenever magnesium must be arc welded.

Brooks & Perkins, Inc., producers of magnesium, note that physical properties of magnesium welds are superior to those on aluminum. Weld metal efficiency will normally be 85 to 95% of the base metal, and ductility is usually very good.

B & P reported the results of a severe test on magnesium projectiles conducted during the course of a missile development program. (Typical magnesium projectiles are fabricated by rolling sheet metal into a cone shape, Tig welding the longitudinal seam, and spinning the piece into its proper contour.)

The magnesium projectiles tested were steel-capped nose sections to which were welded 16-in.-long sections of 3-in. OD tubing with 0.125-in. wall thickness. These projectiles were fired through 3-in.-thick reinforced concrete slabs at velocities up to 500 fps.

After the firing, projectiles were examined. The tube body was shortened up to 5/8 in. by the impact—a deformation that took place by plastic flow of the tube wall under high compressive forces. *But the single circumferential weld between tube and nose section was not damaged.*

This is but one of many tests conducted under extreme conditions by magnesium producers and users alike—and all have proved to their own satisfaction that the metal has got what it takes.

(It should be understood, of course, that all magnesium parts require stress relief; those that are not treated may develop stress cracks. Just what temperatures and time may be involved will naturally vary.)

Question:

In our shop, many jobs entailing the gas welding of broken gray iron castings have come my way. To date, I have not had any marked success with these welding jobs. Oxyacetylene is the gas mixture we use and our rods, we know, are a correct type. We use a proper amount of bevel when butting pieces, but a stress cracking problem still exists that I can't cope with. Could you help me out?

Answer:

Perhaps, like many weldors who are called upon to gas weld cast iron, you don't appreciate the difference between this metal and mild steel. One of the better short discussions of this problem was written by J. W. Rice, and published by the Small Business Administration as one of its "Technical aids for small business."

Mr. Rice points out that: "Gray iron has two distinguishing characteristics—rigidity and high carbon content. If one section of a casting is heated to welding temperature, expansion of that part will set up stresses in adjacent areas sufficient, in many cases, to cause additional breakage.

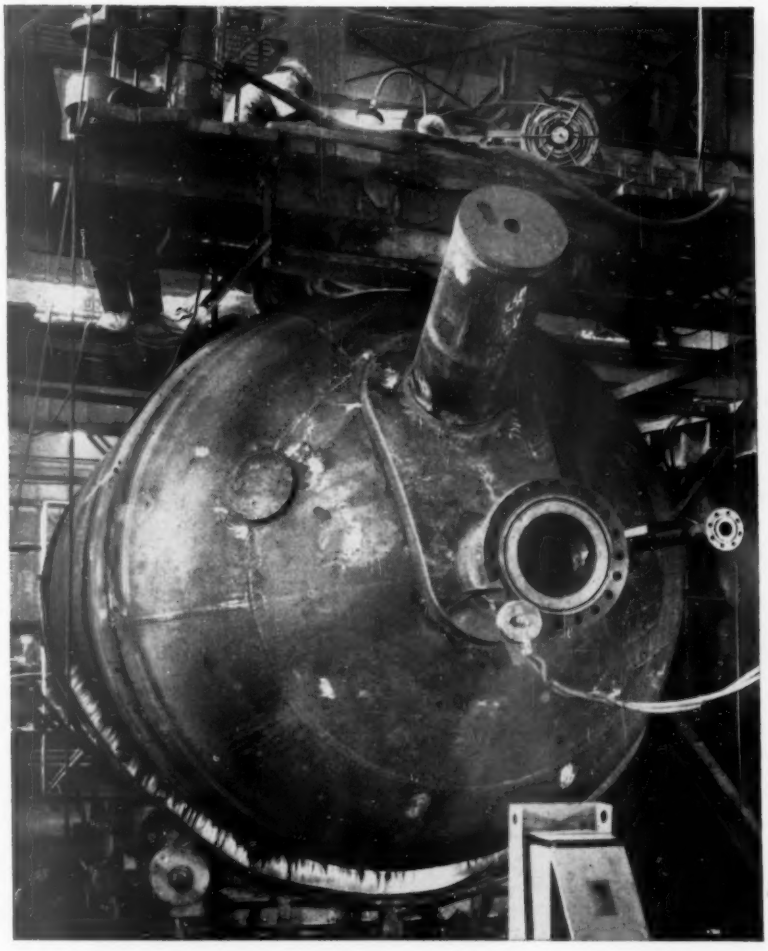
"Once this principle is understood," he continues, "steps can be taken to prevent additional fractures. For example, you may preheat the entire casting, or at least those sections which will be subject to stress, to a moderate temperature. This permits more uniform expansion, and eliminates stresses."

After pointing out that it is casting design which often predetermines the need for, and amount of, preheat, Mr. Rice cites some standard preheat temperatures.

"Once the extent of preheat has been determined, this area is usually brought to a temperature of 800 to 1,050 F—or to 1,250 F in the case of alloy castings. Generally, a preheat should not exceed a temperature of 50 F below that required for welding.

"Lightweight castings, 25 lb or less, are usually torch heated. Those over 25 lb can be heated with a charcoal fire, furnace or by the induction heating method.

"In addition to equalizing stresses, preheating also increases machinability of the weld and allows faster welding. This results in considerable labor and gas savings."



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Why not discuss your stainless welding wire needs with your *Drawalloy* Distributor or Representative . . . a man ready to help you. Bulletin 355-DC provides complete information on every grade of *Drawalloy* wire. Write to: Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 12, Pennsylvania.

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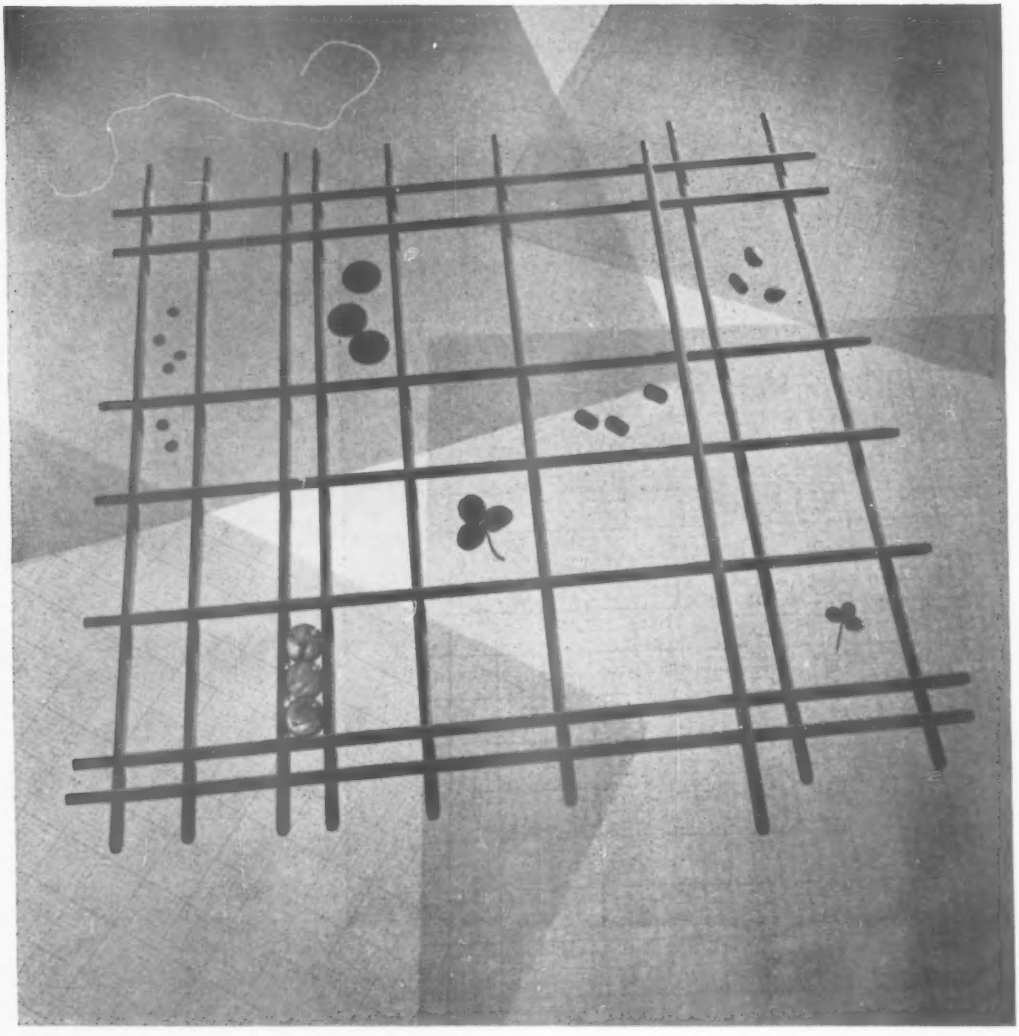
THE WIRE MILL FOR THE WELDING INDUSTRY — STAINLESS STEEL · HARD SURFACING · TOOL STEEL



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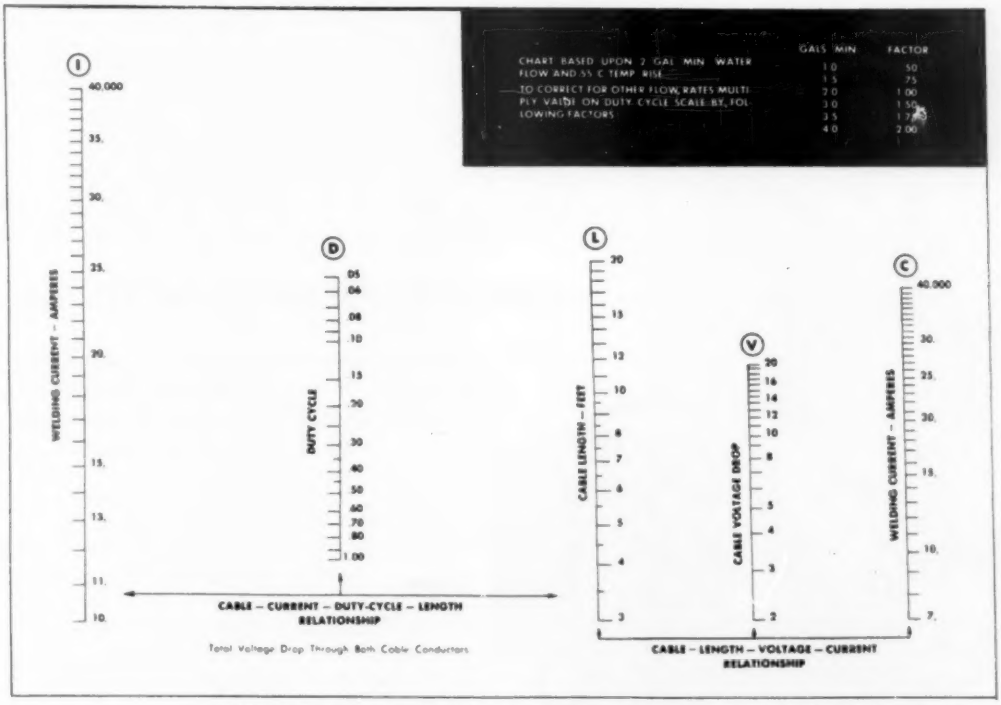
Resistance welding

Cable performance data—II

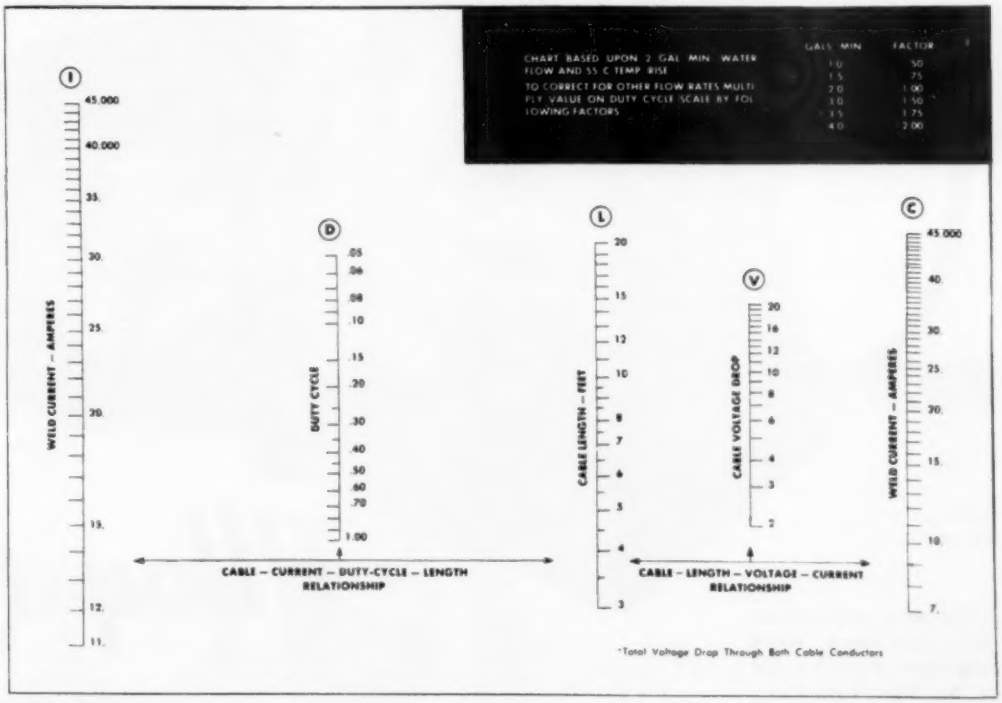
500 MCM CABLE



NOTE—Uniflex has constructed these voltage drop charts employing the impedance at the maximum operating temperature of 70°C.

To determine voltage at 20°C, the basis used by some manufacturers, divide the derived voltage by 1.15.

800 MCM CABLE



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- Priced right—$279.00 F.O.B. York, Pa.

Test this new combination in your own shop. Write stating type of work to be done. An Alloy Rods Company representative will set up a machine for your use.

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Surfacing Combination . . .

equipment maintenance

Wear O Matic

HARD SURFACING WIRES

- PAYOFFPAK* efficiency and economy
- Tension free wire feeding.
- Quick and simple wire change over.
- Accessability and ease of operation.

Here's a new hard surfacing combination designed to cut maintenance costs through easier, faster, more economical application of wear resistant alloys.

From your first experience with the new Wear-O-Matic process, you'll appreciate the many conveniences of the *PAYOFFPAK*. The wire is cleaner and easier to handle and is free of tension for smoother trouble free wire feeding. Larger quantities of wire can be handled with greater ease of change over. There's no kinking or snarling of wires as is common with cumbersome, tightly wound coils.

Wear-O-Matic wire and the new Wear-O-Matic wire feed unit is the labor saving team that will ease your maintenance load. Welding is easy and continuous at speeds up to five times faster than manual electrodes. The Wear-O-Matic unit feeds the wire automatically at the proper pre-selected rate. There's no stopping to change electrodes, no stub loss, no cleaning, and spatter is negligible. And, Wear-O-Matic wires provide weld deposits of uniform metallurgy, chemistry, and wear resistance . . . assuring longer equipment life.

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WEAR-O-MATIC 3—A build up alloy with a machinable deposit. Hardness 20 Rc.

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A build up alloy for manganese steel parts.
Hardness 190 Brinell as welded
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Los Alamos team favors Tig for uranium welds

TECHNIQUES for fusion welding uranium have been developed at Los Alamos, N. M., and experiments have shown the Tig (tungsten inert-gas) process to be most satisfactory.

This is the crux of a paper presented November 6 at a meeting of the American Institute of Mining, Metallurgical, and Petroleum Engineers in Chicago's Morrison Hotel. It was prepared by E. L. Brundige, D. T. Doll, G. S. Hanks and J. M. Taub. All are scientists in the Los Alamos Scientific Laboratory.

The authors point out that, while Tig welding does the job best, it is not the only welding process which can be applied to the heavy, hard, nickel-white metal. Submerged-arc, Mig (metal inert-gas) and resistance spot welding processes may also be used.

URANIUM sheet, plate and shapes can be welded, report the authors. And results can be easily reproduced when the favored Tig process is automated.

Some Distortion

No filler metal is used in Tig welding uranium at Los Alamos, and welding is done with the workpiece in a flat position. Say the authors: "Uranium *cannot* be welded in vertical or overhead positions."

Current chosen as optimum by the scientists was d-c straight polarity —"this type of current results in greater weld penetration at lower amperages, and provides a more stable arc during welding." The authors reported that uranium properly Tig welded with this current was free from porosity, cracks and oxide inclusions.

They also noted that penetration was directly proportionate to welding current used, and that amperage and shielding gas type also had an important bearing on penetration.

At Los Alamos, uranium has been successfully welded in thicknesses ranging from 0.010 to 0.500 in. And experiments indicated that surface condition and purity of argon or helium gas used obviously affected weld soundness.

"Uranium weldments exhibited some distortion," the authors state. "Residual stresses, however, appeared to be minimal due to uranium's plasticity at temperatures above 150 C."

Tensile and yield tests performed in the New Mexico lab indicated that Tig welded uranium joints exceeded the strength of the cast metal. Further, it was stated that welding caused a grain refinement in the fused area whenever cast metal was used.

Helium Is Best

Three prerequisites for the production of sound fusion welds on uranium were cited by the scientific team:

1—A surface relatively free from oxide in the weld area.

2—Dried and purified inert gas (helium gave best results, say the authors).

3—Maintenance of the inert-gas shield to inhibit oxide formation during fusion and cooling.

Fusion welding of uranium sheet, plate and shapes is feasible, the paper states. All three forms can be production welded—particularly with the easily-automated Tig process.

Low Temperature EUTECTIC WELDING ALLOYS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

CRACKED MOTOR BLOCKS NOW WELDED IN PLACE WITH "LOW AMP" XYRON 2-25

To overcome the difficulties of welding motor block cracks due to freeze or accident, "Eutectic" developed patented Xyron 2-25 (AC-DC), the all-position 'Frigid Arc' coated electrode for cast iron.

Use of all-position Xyron 2-25 (AC-DC) on cracked engine blocks eliminates the need for dismantling and extensive cleaning. Weld may be performed in position.

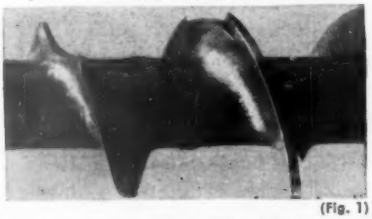
Xyron 2-25 (AC-DC) meets every requirement for use on cracked engine blocks. Machinable dense deposits can generally be made without preheating the oil soaked cast iron. Weld metal is free flowing and has exceptional affinity for cast iron. This is extremely advantageous when long or large deposits must be made... as it minimizes the possibility of cracking or slag inclusion. The lower amperage permitted with *all* Eutectic "Low Temperature Welding Alloys" eliminates distortion, embrittlement, warpage and danger of fusion.

The result: a dense, smooth, crack free, machinable deposit without the necessity of preheating.

Because of its many specialized features, and because of its strength, (ultimate tensile strength of 56,000 psi), thousands of weldors find it necessary to reach for Xyron 2-25 (AC-DC) when the job is a cracked engine block, transmissions, gear housing, cams, levers, machine bases and similar cast iron parts.

"LOW HEAT" OVERLAY SOLVES ABRASION PROBLEM

Rough, tough wear and abrasion weakened and finally snapped off flanges on this high-alloyed steel sand and gravel conveyor screw (figure 1). Abrasion also



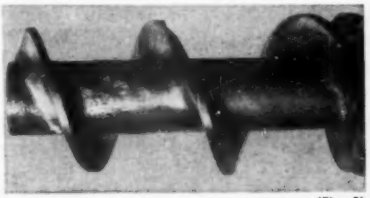
(Fig. 1)

caused pitting and galling. This meant serious maintenance and downtime expenses to management—a West Virginia Mill.

Eutectic's local District Engineer was consulted, and suggested rebuilding the screw with EutecBor #9.

EutecBor #9 is a super-high alloy overlay specifically formulated for use where severe abrasion is a problem. It is non-magnetic in nature and has a hardness as deposited of RC 55-62. EutecBor #9 is also extremely resistant to corrosion and has the added advantage of minimizing weld weakening dilution of the base metal. Deposits of this widely useful alloy accept a high polish and resist pitting and galling (figure 2).

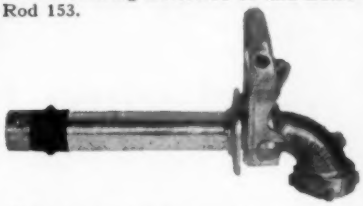
Management now reports conveyor shaft stays in operation much longer without maintenance—effects a considerable savings in downtime and repair costs.



(Fig. 2)

ALUMINUM TO STEEL JOINT "INDESTRUCTIBLE"

An Iowa manufacturer of oil equipment wanted a lighter, stronger fill tube. A steel tube encased in an aluminum tube (except for the very tip) was to be welded to the valve apparatus, a casting of Almag 35 Aluminum. The manufacturer's Chief Research Engineer was told such a weld was impossible. His local "Eutectic" District Engineer recommended testing a procedure utilizing EutecRod 19 and EutecRod 153.



The valve casting was machined to permit a one-inch insertion of the steel tube.

Joining would be done with EutecRod 19 —a self-fluxing, low-melting, solder-type alloy.

EutecRod 153 was chosen to "tin" the steel tube; it has a high affinity to EutecRod 19.

The tubes were cleaned and dipped in the molten EutecRod 153. The high remelt then enabled the insertion of the tube in the Almag casting, and the flow of EutecRod 19 through the joint without burning or reaching the oxidation point of the "tinned" surface on the steel tube. Subsequent destruction tests showed that the Almag casting was completely destroyed, or the steel tube was bent so badly that the part would have been unusable, and yet there was no rupture of the joint area.

SEASON'S GREETINGS

With this issue, we come to the conclusion of the first year of publishing Eutectic Welding News. We trust the articles contained on these pages have proven to be of value. We will strive to continue presenting new cost and time saving ways of using 'Low Temperature Welding Alloys.'

As 1958 quickly approaches we wish to take this opportunity of extending to you Season's Greetings, and Best Wishes for a Happy and Prosperous New Year.

A look at safety

Studies of grinding wheels reveal that proper use and attention lengthen wheel life and promote safety.

Grinding wheels need care for best service and life

PRUDENT grinders make sure—as this man does—that wheels are guarded and face shields are down.

LIKE ALL other tools used in welding shops, grinding wheels can be treated the wrong way . . . or the right way.

If wheels are handled correctly, their long life and the worker's safety is assured. If grinding wheels are misused, their usefulness nose-dives and they may become revolving menaces.

Proper handling of grinding wheels is not complicated; most safety rules are rooted in common sense. But safety rules, being rules, are repeatedly broken, either through ignorance or carelessness. It is for this reason that WELDING ENGINEER offers these suggestions for grinding wheel care.

Inspecting Wheels

Grinding wheel care actually begins the moment a new shipment of abrasives arrives in the plant. Inspection is the first step. Even before wheels are uncrated, an alert supervisor carefully examines cartons for signs of damage in transit. Tears or ugly dents are a clue to him that a husky handler has not taken "Fragile" stickers seriously. Marks of abuse indicate that materials inside may also have been damaged. He will give *these* wheels special attention.

As soon as he lifts the wheels from their containers, he checks them thoroughly for any visible cracks or flaws. If he is satisfied with his examination, the supervisor gives them one further trial—the ring test.

To conduct this test, he first makes sure wheels are dry and not covered with sawdust or other foreign matter. If wheels are light enough, he thrusts his finger through the mounting hole; heavier wheels can be hung on a nail. Wheels that cannot be suspended in either manner are placed on edge in a clean floor area.

With a non-metallic object (a screwdriver handle for small wheels —a wooden mallet for larger, heavier pieces), he taps the wheel at 45 deg on either side of an imaginary vertical center line, generally 1 or 2 in. from the edge. Should he strike along the center line, the test might be inconclusive.

A flawless wheel will give off a clear sound when it is tapped. Although vitrified-bonded wheels respond best to this test, organically-bonded wheels also can be examined in the same way. They do not ring as sharply and metallically, however.

After testing all wheels in the lot, the supervisor is able to weed out defective units. He repeats this test if a wheel has not been used for a considerable period of time.

Wheel Storage

Grinding wheels break easily and inorganically-bonded wheels are especially brittle. So our alert supervisor insists wheels be handled gingerly on their way to the storeroom.

Wheels too heavy to carry are loaded on a truck which will give them adequate support during shifting operations—he forbids rolling grinding wheels as if they were hoops.

Grinding wheel storage arrangements in an up-to-date welding shop should receive as much attention as the electrode storage facilities. Temperature and humidity should be rigorously controlled.

This may seem petty and old-maidish. The fact is, however, that extreme temperatures—especially those below freezing—have a vicious effect on some bonds. High humidity, or dampness, loosens abrasive grains in their bonds. During a grinding job, these weakened grits will flake away from the wheel. Result? . . . one nearly worthless grinding wheel.

Well aware of these dangers, many shops place a pan of water in storage

NOW! EXCLUSIVE, CUSHION-SOFT FRAMES PROVIDE COMFORT-FIT EYE PROTECTION

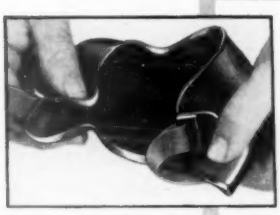
New Welsh Cover Goggles And Eye Shields Feature Unique, Soft, Light, Pliable Frames

Patent Pending

STYLE 5050 — WELSH "SOFT-I" FOR WELDERS

Welders' Soft Side Cover Goggles—Soft, pliable frame adapts comfortably to facial contours. Deep cups fit easily over prescription goggles. CR-39 Plastic cover lens are standard.

Style 5051
—Welsh "Soft-I" for Chippers'



Patent Pending

STYLE 5070 — WELSH "CYCLOPS" FOR WELDERS

Welders' Soft Side Eye Shield—Soft, resilient, one piece, opaque frame blends comfortably to the face. Simplified lens holder eliminates need for springs and washers and permits easy changing of filter and cover plates. CR-39 Plastic cover plate is standard.

Style 5071—Welsh "Cyclops" for Chipers'

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areas and keep an electric light burning constantly. The light helps to hold temperatures near an ideal 70 F. The water arrests humidity at 30-50%, best for wheels.

Room Location

Even though wheels should be stored as close as possible to the spot where they will be used, storage locations should not be near areas of heavy traffic. There is always risk of vibrations jiggling wheels from their place.

Storage rack construction should allow for separation of wheels into types. That is, cone wheels are stored with cone wheels, straight wheels with others of the same type.

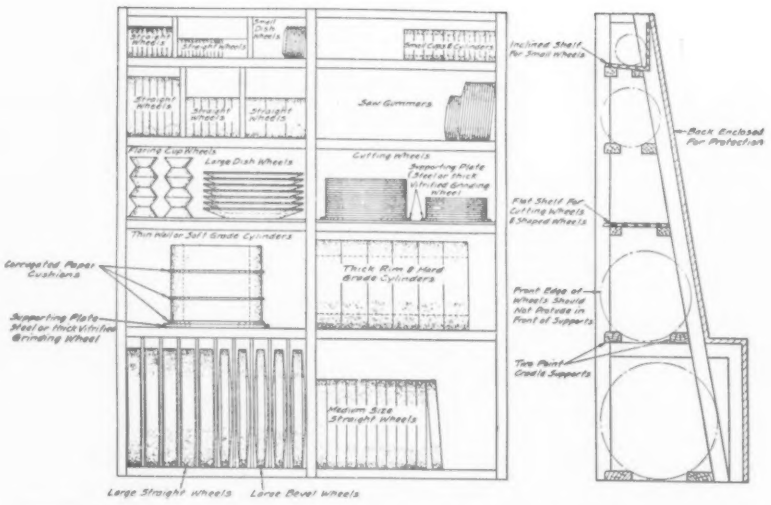
A simplified storage plan permits small units to remain in their carton until needed.

Larger wheels, however, are not as rough and tough as they look. In general, they are given special treatment in storage. Large organic-bonded wheels may be stacked—but never higher than 3 ft. Thin, organic-bonded cut-off wheels may also be stacked.

Straight and tapered wheels are supported in an upright position. Good access to them—and to all wheels—is important to avoid constant handling, and for the sake of convenience.

Cylinder wheels and large cup wheels may also be stored flat. Unlike other stacked wheels, they must be separated by corrugated paper or some cushioning material.

If a wheel is dropped during handling or storage, it may be cracked and should not be used.


Small Dish Wheels
Straight Wheels
Small Cone & Cylinders
Inclined Shelf for Small Wheels
Straight Wheels
Saw Gummers
Rack Enclosed For Protection
Flaring Cup Wheels
Large Dish Wheels
Cutting Wheels
Supporting Plate Steel or thick Vitrified Grinding Wheel
Flat Shelf for Cutting Wheels & Shaped Wheels
Thin Hard or Soft Grade Cylinders
Corrugated Paper Cushions
Thick Rim & Hard Grade Cylinders
Supporting Plate Steel or thick Vitrified Grinding Wheel
Front Edge of Wheels Should Not Protude in Front of Supports
Two Point Cradle Supports
Medium Size Straight Wheels
Large Straight Wheels
Large Bevel Wheels

THIS is how grinding wheels should be stored for maximum protection and accessibility.

Wheels at Work

Proper storage is not the end-all and be-all of good wheel management—but it is insurance for the day these wheels are put to work. In fact, on-the-job care is, perhaps, most important of all. Some carelessness in storage may not be harmful, but laxity in wheel operation courts disaster.

First checkpoint when fitting a grinding wheel on a machine is its flanges. Flanges are the collars, discs, or plates holding the wheel. Some flanges are designed as adaptors, enabling use of a wheel whose hole is larger than the machine's arbor, or spindle. Other flanges support wheels, help drive them, or act as a protection against breakage.

A flange must not be less than one-third of the wheel's diameter; in certain cases flanges should be larger. Large flanges are stipulated because they relieve rotation stresses and help dissipate heat built up at the wheel's mounting hole.

Blotters, serving as compressible washers, must be fitted between flange and wheel to absorb some of the pressures bearing upon the flange.

Damage is frequently done to wheels when misguided workers attempt to force them on a too-small spindle. This should never be done. Nor should a hole be enlarged to fit an arbor. If one wheel doesn't fit, try another.

Wheel Mounting

Mounting a wheel is a trade term for fitting the wheel onto the arbor. Part of this process has been covered during the discussion of flanges, but more must be added because one-third of all grinding wheel difficulties can be traced to improper mounting.

Operators, having followed all other precautions related to flanges, must make sure all contacting surfaces are clean and smooth. Accurate fit of the wheel, after it has been put on the arbor, will insure free (but not loose) turning, and will allow for possible heat expansion during wheel operation.

Wheel bushings must not extend beyond the wheel's sides, and the

STANDARD MAXIMUM SPEEDS

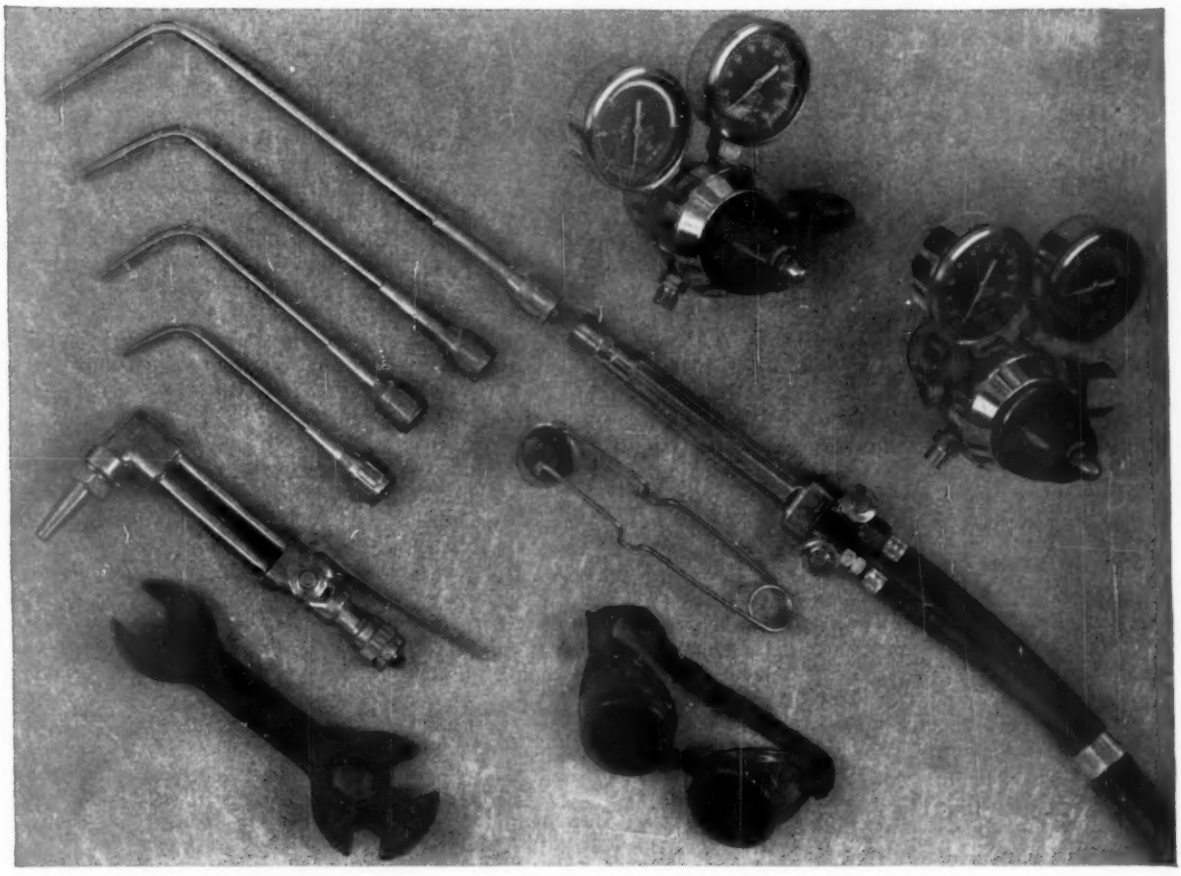
Classification Number	Types of Wheels		Vitrified and Silicate Bonds			Organic Bonds		
			Low Strength	Medium Strength	High Strength	Low Strength	Medium Strength	High Strength
			SFPM	SFPM	SFPM	SFPM	SFPM	SFPM
1	*Type 1—Straight Wheels (Except classification No. 7 Below) *Type 4—Taper Wheels *Types 5 and 7—Recessed Wheels *Type 12—Dish Wheels *Type 13—Saucer Wheels		5,500	6,000	6,500	6,500	8,000	9,500
2	*Type 2—Cylinder Wheels		4,500	5,500	6,000	5,000	6,000	7,000
3	**Dovetail Wheels *Type 11—Flaring Cups		4,500	5,500	6,000	6,000	8,000	9,500
4	*Type 6—Cup Wheels		4,500	5,000	5,500	6,000	8,000	9,500
5	Abrasive Discs—#Plate mounted Inserted nut, & Projecting Stud		5,500	6,000	6,500	5,500	7,000	8,500
6	Cylinder Type Abrasives Discs #-Plate Mounted, Inserted Nut, & Projecting Stud.		4,500	5,500	6,000	5,000	6,000	7,000
7	Type 1 - Reinforced 10" dia. & Smaller - ½" Thick and under except Cutting-off Wheels					9,500	12,000	14,200
8	Type 27 - Depressed Center Reinforced Wheels					9,500	12,000	14,200
9	Diamond Wheels	Cutting Wheels						
		(a) Metal bonded with Steel center						14,000
		(b) Metal bonded with Metallic compound center						7,500
		(c) Resin bonded with Resin or Metallic compound center						7,500
		All other types						6,500

Note: When wheels of unusual and extreme shapes such as deep cups with thin walls or backs, long drums or with large center holes are required, consult wheel manufacturer for speeds recommended.

Note: Maximum speeds indicated are based on the strength of the wheels and not on their cutting efficiency. Best speeds may sometimes be considerably lower.

* Standard Shapes. ** Non-Standard Shapes.

Meet the Complete LIQUIDWELD *Family...*



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spindle end-nut should be tightened only enough to insure a firm hold. A nut tightened too much will strain the wheel.

During the Korean war, many American lives were saved because the army issued shrapnel protective vests to GI's. Protection hoods over grinding wheels serve the same purpose: they save bystanders from flying chunks or slivers if a wheel should break. Protective hoods should cover at least half of the wheel.

Just as a GI vest was no defense if it was left behind in a foxhole, a hood is no protection if it is not over the wheel *before* power is switched on.

Dust exhausters are recommended for dry grinding machines. This is so important that the American Standard Association's safety code uses the commanding *shall* instead of the "you-can-do-it-if-you-want-to" *should* when they speak of installing dust exhausters. The Association, like welding experts, realizes the danger of constant dust inhalation.

Speed Control

Excessive grinding wheel speeds present a clear threat to operators. It is for this reason that the maximum speed at which a wheel can be run is stamped upon each wheel. This speed does not necessarily indicate the wheel's most efficient range; it *does* indicate its *safe* maximum speed. Obviously, wheel speed must never exceed this limit.

To stay within speed boundaries, more than simple observation of stamped speeds is necessary. Machines with adjustable rpm's should be checked to insure that their settings are corrected to match surface speeds of a grinding wheel.

Spindle speeds on portable grinders fall into the same category; with these, however, an additional safety measure must be taken, especially with pneumatically-operated units. This step involves proper adjustment of air pressures and proper functioning of governors.

After he has checklisted all the foregoing safety precautions, the operator is ready to start his work. Before he does so, however, he places his safety goggles, or face shield, into position. Neither device serves any purpose when perched on his forehead.

If he is working with a new wheel, or one which has not been used for some time, the operator allows it to run free for a minute while he stands well to one side. This practice gives protection against a defective wheel which might have slipped past inspectors.

Even though he is ready to grind, the operator still exercises restraint. Jamming a workpiece against a newly started wheel can lead, he knows, to sudden breakage. Therefore, he feeds the work slowly, giving the wheel an opportunity to warm up. An experienced operator never attempts to grind a metal for which the wheel was not designed. This is an extremely wasteful and unsafe practice.

Safety Tips

Many operators have a bad habit of grinding on the side of a straight wheel on a bench or floor grinder. When that side is badly worn, a sudden—or severe—pressure may shatter the entire wheel.

Throughout the day, a grinding machine should be periodically stopped and checked. A few minutes of close attention to adaptors, arbors and flanges will forestall an accident. While the grinder is down, any called-for lubrication should be made. The point most often needing oil or grease, because of overheating, is the spindle.

If a work rest is attached to the grinder, it must be no more than $\frac{1}{8}$ in. from the wheel. A greater distance offers an opportunity for the workpiece to slip between the rest and the wheel, leading to damage of some kind. Any adjustments to the workrest, however, should be made before starting the grinder, not while the wheel is in motion.

Dressing and Truing

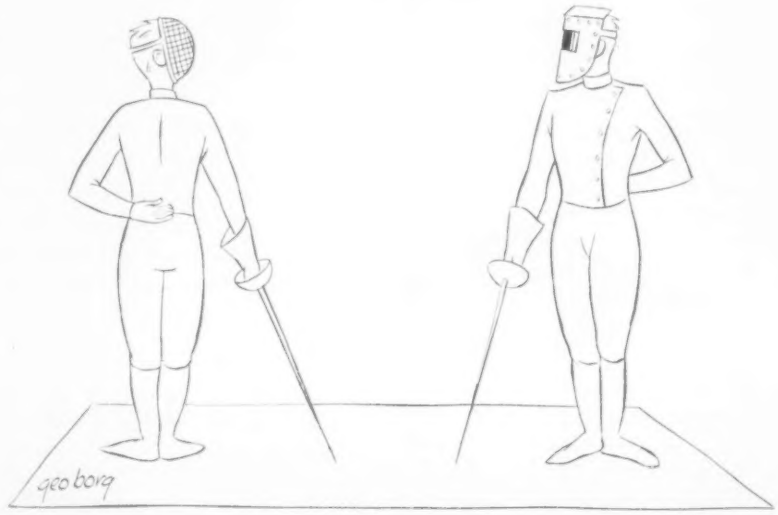
Mechanical removal of abrasive grains is known as *dressing*. Returning a wheel to the round, or grinding special contours on it, is known as *truing*. Both processes were designed to give extra life and extra service to wheels that might otherwise have to be discarded.

Tools for this work can be mechanical, like the *star* or Huntington-type dresser; abrasive, using a harder wheel to dress or true a softer one; diamonds; and/or crush forming, in which desired wheel shapes are cut into a metal roll that, in turn, is rotated against the grinding wheel.

However, dressing and truing is not work to be done by an ambitious amateur. It is a precision operation and requires the attention of a skilled workman. Carelessness could easily remove valuable abrasive grains or even ruin a wheel. But, done by an expert, dressing and truing can save many abrasive dollars.

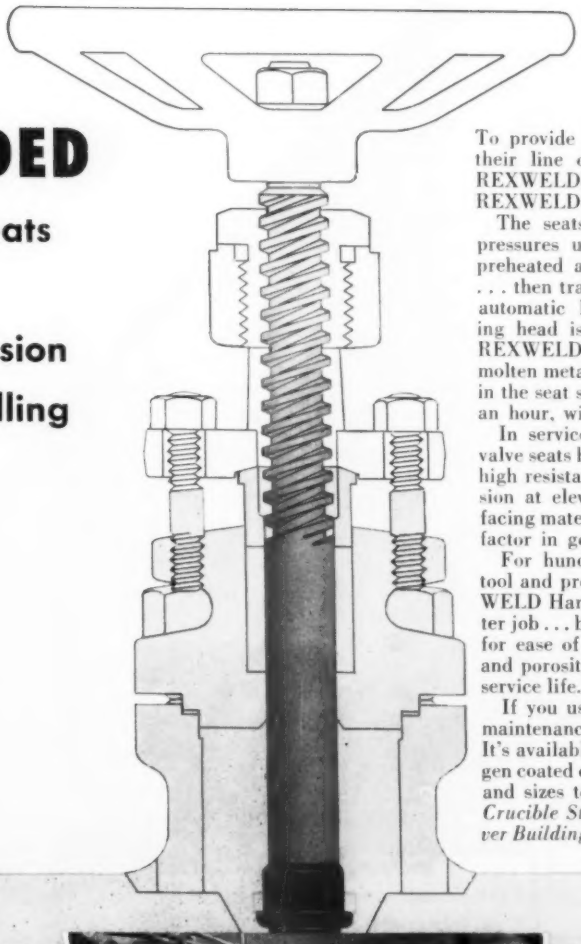
Grinding wheels are one of science's gifts to welding. Despite the gift's surface simplicity, grinding wheels are actually complex, highly-developed tools. As such, they must be given the same attention that is lavished on equipment more complicated in appearance.

If they *do* receive proper care, grinding wheels will give many hours of swift, efficient service.



REXWELDED

steam valve seats resist erosion, corrosion, abrasion ... are non-galling



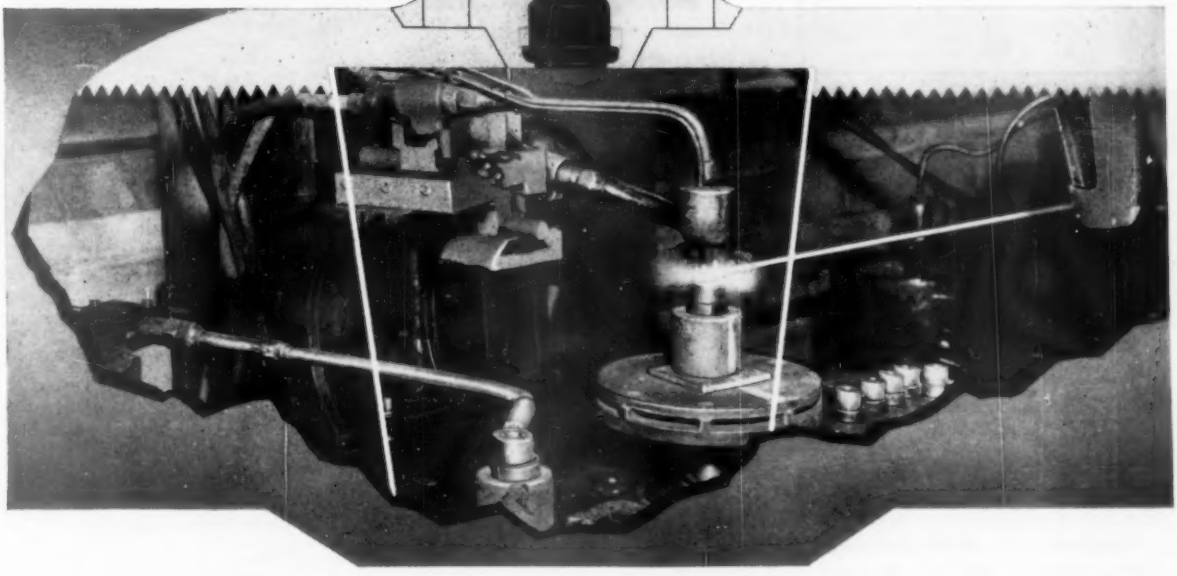
To provide long, trouble-free service life for their line of gate valves, the manufacturer REXWELDED the valve seats with Crucible REXWELD A Hard Surfacing Rods.

The seats for these valves, which handle pressures up to 800 psi at 750°F, are first preheated as shown in left portion of photo . . . then transferred to welding table of semi-automatic hardfacing machine. After welding head is lowered hydraulically, a rod of REXWELD A is fed into the flame and the molten metal is deposited in the circular recess in the seat surface. Machine produces 70 seats an hour, with a rejection rate of only 1%.

In service these REXWELD hard-surfaced valve seats have demonstrated an exceptionally high resistance to erosion, corrosion and abrasion at elevated temperatures, and the hard-facing material does not gall—a very important factor in good valve operation.

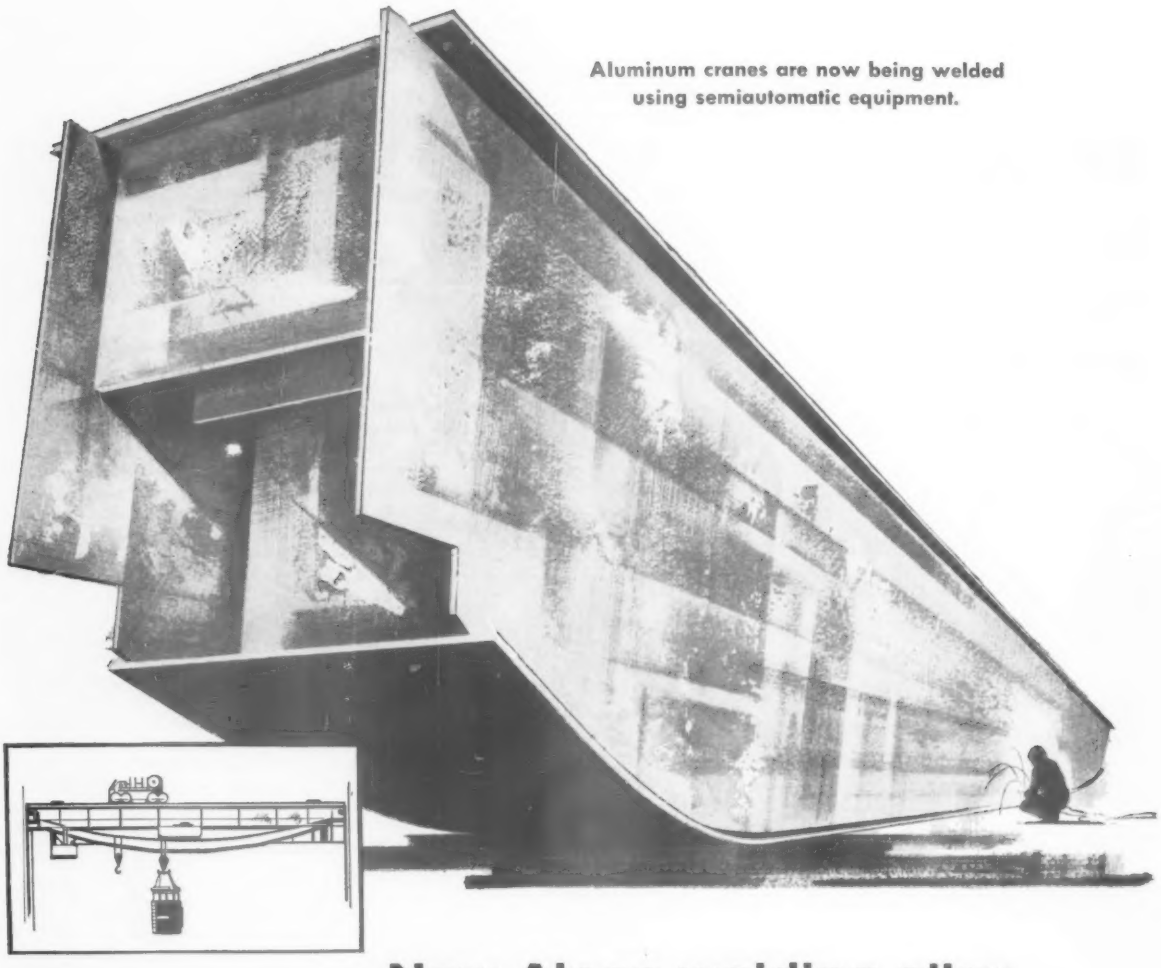
For hundreds of other applications where tool and product life must be increased, REXWELD Hard Surfacing Rods have done a better job . . . because they are especially designed for ease of application and to produce crack and porosity free surfaces that give maximum service life.

If you use hard surfacing in production or maintenance, be sure you order REXWELD. It's available in both bare rods and low hydrogen coated electrodes—in many different grades and sizes to meet your specific requirements. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*



CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



Aluminum cranes are now being welded using semiautomatic equipment.

New Alcoa welding alloy makes possible the aluminum crane

For a long time, the idea of an aluminum crane has interested designers. Much lighter in weight, it would permit lower cost building foundations or a higher capacity crane on the same foundations. But how to make it? Riveted construction is outmoded and expensive.

Now aluminum cranes are being built, thanks to a new Alcoa alloy. Designated 5456, this new alloy has the highest as-welded strength of any commercial aluminum alloy yet developed. Guaranteed minimum properties are 42,000 psi ultimate and 19,000 psi yield on the plate and equally good ultimate strength across the weld.

Using the new alloy and the inert-gas consumable-electrode process, it costs no more to fabricate aluminum cranes than steel cranes. There are long welding runs involved, up to 60 feet, and semiautomatic equipment is used. Speeds as high as 80″ per minute are achieved.

In addition to their light weight, these aluminum cranes can be used in corrosive atmospheres and will require no painting.

Alcoa is headquarters for fresh and exciting ideas like this on how to weld, braze or solder aluminum. Get in touch with an Alcoa distributor listed at right. And write now for booklets and films that show how easy it is to weld, braze and solder aluminum. Aluminum Company of America, 1740-M Alcoa Building, Pittsburgh 19, Pa.

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Want technical help in welding, brazing or soldering aluminum? Contact your Alcoa sales office, listed under "Aluminum" in the Yellow Pages of your phone book.

For immediate delivery of Alcoa welding products, call your Alcoa outlet listed below. He carries a complete range of alloys and sizes.

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Machinery & Welder Corp.

New cooler for Tig and Mig welding guns

A PORTABLE cooler for Tig and Mig welding equipment is a recent development of Bernard Welding Equipment Co., Chicago. The 68-lb unit was designed "to solve the heat-removing problem which has restricted full potentialities of gas-shielded arc welding processes."

The Bernard cooler is said to provide a reliable and efficient coolant source that is simple to operate and "practically fool-proof." The firm notes that use of the new unit eliminates the need for long lengths of hose from city water mains or large storage tanks.

Other than its need for a current source, the cooler is completely self-contained and highly portable.

Nine-Quart Capacity

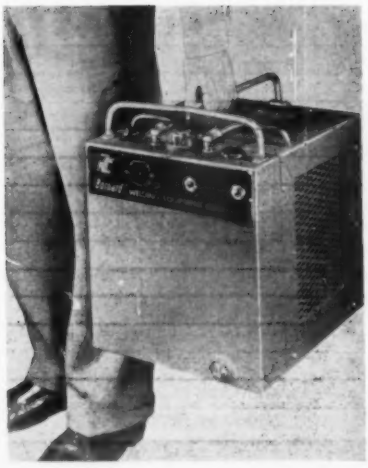
A positive displacement, planetary-gear pump within the small unit draws coolant from a nine-quart reservoir and circulates it through the welding equipment to absorb excess heat. Coolant returning to the case is passed through a three-stage radiating system.

Radiating units receive high-pressure air from a compression chamber packed by a four-bladed fan.

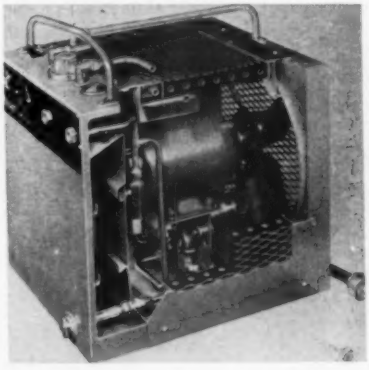
To protect the pump and welding equipment, a 120-mesh filter is located on the intake side of the pump. This filter can be removed for inspection and cleaning.

An adjustable by-pass pressure relief valve is provided to maintain constant pre-set coolant pressures. Bernard reports that the cooler's sealed ball bearing construction and oversize electrical components—plus the heavy-gage steel cabinet encasing all operating parts—assure more dependable service.

Cooler model "No. 500" is reportedly rated at 500 amp when cooling any Mig or Tig gun operating on a 100% duty cycle, as well as 15 ft of No. 8 water-cooled current cable.



COOLER weighs 68 lb and is completely self-contained except for current source requirement.



The firm states that higher intermittent amperages (600 or 700) can be handled, depending on duty cycle. At lower amperages and at normal duty cycles, the cooler is said to be capable of handling two or more welding guns.

Flow Rate

Maximum caloric rating of the cooler is 250 Btu per minute at a room temperature of 75 F. Maximum coolant flow rate is 1.9 quarts per minute—said to be more than ample in view of the unit's heat-removing efficiency. Pressure of circulated coolant is adjustable from 0 to 100 psi.

Cooler safety features cited by Bernard are: (*1*) a socket on the front panel into which welding equipment is plugged so that welding is impossible without simultaneous cooler operation; (*2*) a pilot light indicating cooler operation, and (*3*) a transparent dome on top of the cooler which visibly indicates coolant flow.

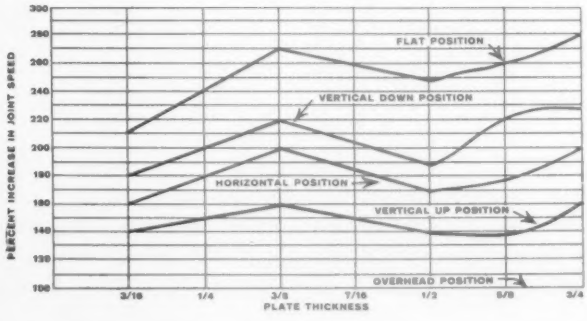
POSITIONERS

MODEL	CAPACITY
1P	100 lb. @ 3" Center of Gravity
5H	500 lb. @ 6" " " "
5P	500 lb. @ 6" " " "
10P	1000 lb. @ 4" " " "
25H	2500 lb. @ 6" " " "
25P	2500 lb. @ 6" " " "
30P	3000 lb. @ 12" " " "
60P	6000 lb. @ 12" " " "
100P	10000 lb. @ 12" " " "
160P	16000 lb. @ 12" " " "
240P	24000 lb. @ 12" " " "
400P	40000 lb. @ 12" " " "
600P	60000 lb. @ 20" " " "

Power elevation, electronic variable speed drives, special speeds and mechanical variations are available as optional features on most equipment. Other positioners up to 100,000 pounds capacity are available. For complete details of specific models write to Worthington Corporation, Plainfield, N. J.

INCREASE WELDING

with positioning equipment from



With a positioner you can often drastically reduce the cost of welding and work handling operations.

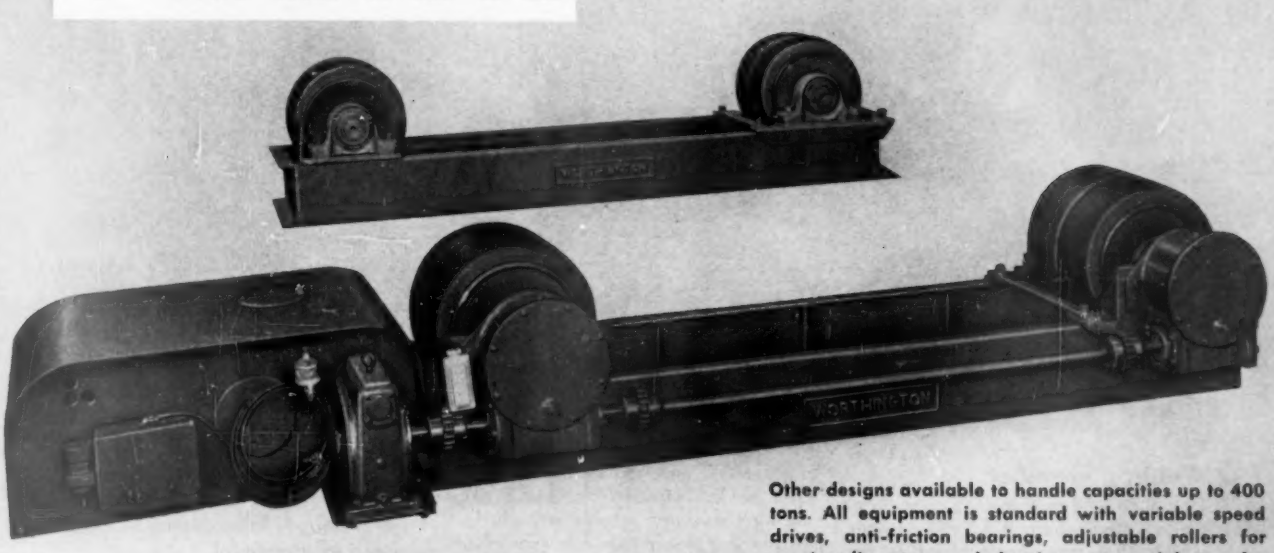
As the chart shows, joint speed in the downhand position is up to 280% faster than the other positions. With a positioner you always weld "downhand." Without a positioner it often takes more time and labor to handle the weldment than it does to actually weld the piece.

WHY WORTHINGTON?

There are many reasons why more welding is done on Worthington positioners than all others combined. One is

TURNING ROLLS

MODEL	TURNING CAPACITY		WEIGHT CAPACITY PER UNIT	
	METAL ROLLERS	RUBBER ROLLERS	METAL ROLLERS	RUBBER ROLLERS
A	9 tons	6 tons	3½ tons	2 tons
AA	10 tons	10 tons	5 tons	3½ tons
B	50 tons	30 tons	12½ tons	10 tons
C	100 tons	60 tons	20 tons	20 tons
D	180 tons	90 tons	30 tons	30 tons



Other designs available to handle capacities up to 400 tons. All equipment is standard with variable speed drives, anti-friction bearings, adjustable rollers for varying diameters, and electric remote push button for forward and reverse rotation. Optional features include tachometer and electric remote variable speed control.

Worthington turning rolls are also available in self-propelled models offering power driven and idler cars for power and idler rolls. For complete specifications write to Worthington Corporation, Plainfield, N.J.

SPEED UP TO 280%

Worthington's complete line

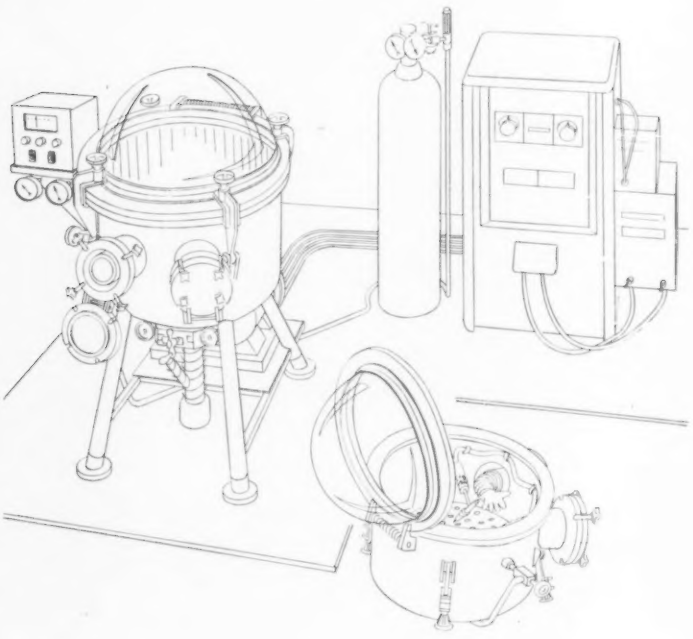
good service. With distributors in all principal cities a Worthington positioning specialist is nearby to help solve your welding problems.

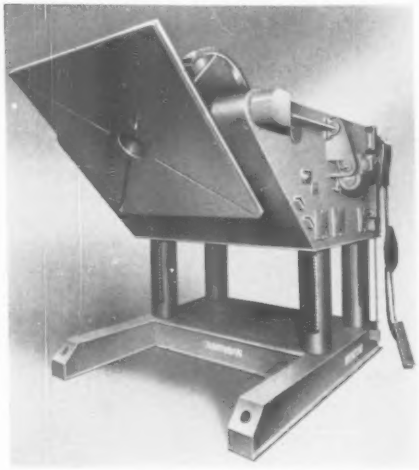
Conservative ratings are another. Worthington engineers its positioners to deliver year after year the rating stamped on the nameplate. And Worthington brings the industry's broadest background of experience and know-how to bear on your positioning problems. Conceived in the fabricating shop of Ransome Machine Co.—later to become a division of Worthington—positioners were pioneered by Worthington people for more than 25 years.

Let us help you increase welding speed up to 280%. For descriptive information on Worthington's line of positioners, automatic welding head manipulators, turning rolls, and head and tailstocks, write to Section Y-76, Worthington Corporation, Plainfield, New Jersey.

WORTHINGTON

new products . . . . . USE CARD ON PAGE 115





LEFT: Plexiglass dome covers a new controlled atmosphere welding chamber used to weld titanium, zirconium, etc. ABOVE: New type of geared elevation principle is incorporated in this heavy-duty welding positioner. (See stories below)

Welding chamber

PLEXIGLASS dome tops a new controlled atmosphere welding chamber which offers maximum visibility for welding such metals as zirconium, titanium and Zircoloy-2. The chamber provides controlled pressure of inert gas for such activities as metallurgical research. A 24 in. diameter upright chamber has a bubble-type dome. Spring-loaded for production welding, the dome is made from materials with low outgassing characteristics. A welding torch and power supply are included in the complete system. *L & B Welding Equipment Co.*

Circle No. 1

Hardfacing method

HEXAGONAL plates of cemented tungsten carbide assembled in a continuous pattern on adhesive glass fiber backing comprises "Kenplate," a method of hardfacing metal surfaces against abrasion and wear. The glass fiber backing provides flexible sheets or strips to be applied to flat or curved surfaces. The adhesive backing holds the small plates in position while they are bonded by epoxy adhesives, silver solder or conventional brazing materials.

Two sizes of hexagons, each in three thicknesses, are being produced. Thicknesses are 0.040, 1/16 and 1/8 in. for 0.210-in. plates and 1/16, 1/8 and 1/4 in. for 0.425 in. plates. The hexagonal shape avoids straight-line joints. Suggested uses are wear plates for mills and mold liners for abrasive materials. *Kennametal Inc.*

Circle No. 2

Resistance welder

SPECIAL lap seam resistance welder joins successive strips of aluminum alloys for continuous processing. The welder handles alloys such as 61S, 24S and 75S, from 0.010 to 0.080 in. thick, in strips as wide as 64 in. Aluminum strip is fed into the welder prior to heat treating. A built-in shear square cuts the trailing edge of one uncoiled strip and the leading edge of the following strip. Four welding wheels move across the overlapped edges, joining the two strips. *Taylor-Winfield Corp.*

Circle No. 3

Alloy

IRON-chromium-aluminum alloy is for use on moderately high-temperature resistance heating applications such as small appliances, and on industrial heating devices where continuous operating temperatures do not exceed 2,150 F. Known as alloy 815, it has high resistivity, low specific gravity and high resistance to oxidation. *Hoskins Mfg. Co.*

Circle No. 4

Weld positioner

IN a heavy-duty model GE250 welding positioner, a new type of geared elevation principle is incorporated. The machine has a weight capacity of 25,000 lb with the center of gravity location of the work 12 in. above the table and 12 in. off-center. A four-speed transmission is built into the drive system as standard equipment. The table tilts 135 deg in 47 seconds. All elevator mechanisms including the columns are inside the chassis, with nothing extending above the top of the chassis to obstruct turning of large weldments. *Aronson Machine Co.*

Circle No. 5

Control unit

WELD-cycle control unit has been designed to provide programmed control of all functions of machine Tig welding. The unit consists of a main panel with adjustable control mechanisms, and a push-button remote control station. System is for use with h-f current and d-c straight polarity welding power from a saturable-reactor-controlled rectifier-type supply. It is designed for applications requiring precise weld timing and crater filling on repetitive circumferential or longitudinal welds. *Air Reduction Co., Inc.*

Circle No. 6

(PATENT APPLIED FOR)

NEW MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

SAFETY BACK makes obsolete ordinary safety features such as anchor bushings, safety rings, special hub mountings, or revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

NO OTHER WHEEL—AT ANY PRICE—OFFERS THESE EXCLUSIVE FEATURES

- **Greatest Initial Strength**
- **Highest Safety Factor**
- **Easy Mounting—Easy Operation**
- **Improved Mounting Base**
- **One Piece Assembly**
- **Requires No Adjustment**

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM-722

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

SAVE COSTLY REPLACEMENTS

...get fast, strong repairs with Bridgeport No. 192 Low-Fuming Bronze Rod

This scale was a vital link in a plant's materials weighing section. Operations slowed down when its cast iron frame was smashed. Braze welding with Bridgeport No.192 Low-Fuming Bronze Rod had it back on the job good as new in a matter of hours... another example of time and money saved through repair with braze welding.

Bridgeport No. 192 is a low-fuming manganese-type, all-purpose rod recommended for both repair and production welding. It tins readily and the base metal needs relatively little local preheating, thus avoiding brittleness. Many repairs are possible without disassembling or moving heavy equipment. And welds are frequently stronger than the base metal.

Write today for your free copy of Bridgeport's new booklet, "Bronze Welding Alloys."

HANDY GUIDE TO BRIDGEPORT WELDING ALLOYS

ALLOY	Welding Method	Approx. Melting Point °F
192 Low Fuming Manganese	GAS	1600
191 Manganese Bronze (Navy)	GAS	1600
196 Bridgeport Bronze	GAS	1600
606 Silicon Bronze (3% Si)	GAS or ARC	1865
548 Nickel Silver	GAS	1675

Bridgeport BRASS Co.

BRIDGEPORT BRASS

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Conn. • In Canada: Noranda Copper and Brass Ltd., Montreal

BRASS • BRONZE • COPPER • SHEET • ROD • WIRE • TUBE • ALUMINUM EXTRUSIONS AND FORGINGS

Weld booths

DESIGNED to overcome the hazards of toxic gases and arc flashes during welding, the Series W-200-75 welding booths feature high velocity suction and durable steel side extensions. Sizes of the booths vary: height 30 to 42 in., width 30 to 60 in., depth 28 in. to 36 in. Blowers are available with air movement power of 400 to 1,650 cu ft per minute. *Engwald Corp.*

Circle No. 7

Tip holder

AN accessory for making simultaneous parallel cuts with one cutting torch is the Duplex Tip Holder. It may be set to cut strips of any width from 1¼ to 12 in., in plate thicknesses up to 3 in. Tip separation is set without tools and without changing torch height. The holder facilitates plate ripping and simultaneous cutting of small pieces or inside and outside circles. It will accommodate acetylene, propane or natural-gas tips. *Air Reduction Co., Inc.*

Circle No. 8

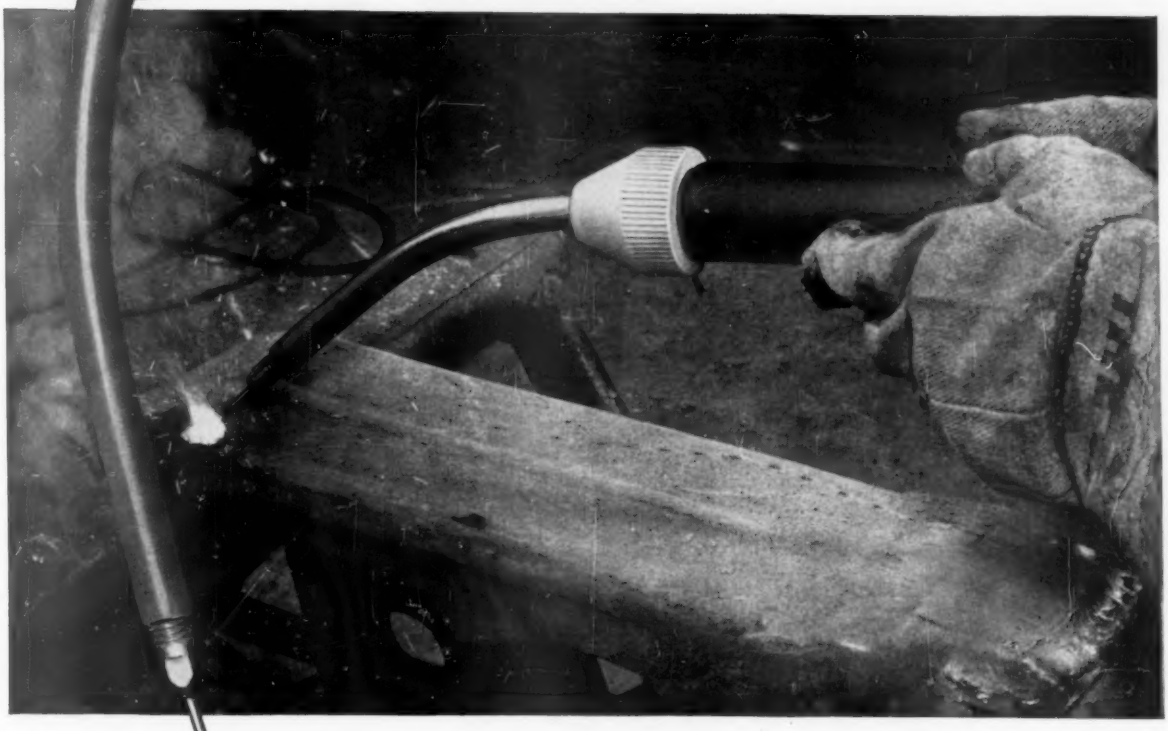
Welding curtain

NARY a sewed seam will be found on this welding curtain, the manufacturer insists. Seams are all vulcanized. The "neo-nylon" curtain will resist burning sparks and grease; oils and most acids will not affect "Lite-Kote." Special sizes are available. *Robin W. Adair Co., Inc.*

Circle No. 16

AMSCO TUBE RODS

for semi-automatic HARDFACING



The perfect uniformity of Amsco Tube Rod insures smooth, trouble-free feed to the work. Note hardfacing alloy compactly enclosed within the steel tube.

Here are new, improved tube rods . . . *specially designed and engineered* for semi-automatic hardfacing! They have *proved* their speed, quality of weld and uniform deposit in actual use tests. In many cases, deposition rate has been increased up to 200% over other types of semi-automatic electrodes.

Amsco® Tube Rods are perfectly symmetrical, steel-shell wires, with the various alloys firmly enclosed and evenly distributed, for proper weld deposit. The steel shell is work-hardened to provide rods that will not deform or snarl during welding . . . that will run well in any semi-automatic welder. The rods are pre-lubricated, to insure constant and uninterrupted feeding to the work.

For additional information and technical data on Amsco Tube Rods or the Amsco MF Semi-Automatic Welder, see your Amsco Welding Distributor. Or write to Amsco Welding Department SA, Chicago Heights, Ill.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS; JOLIETTE, QUEBEC

When welded aluminum must meet exacting standards...severe service

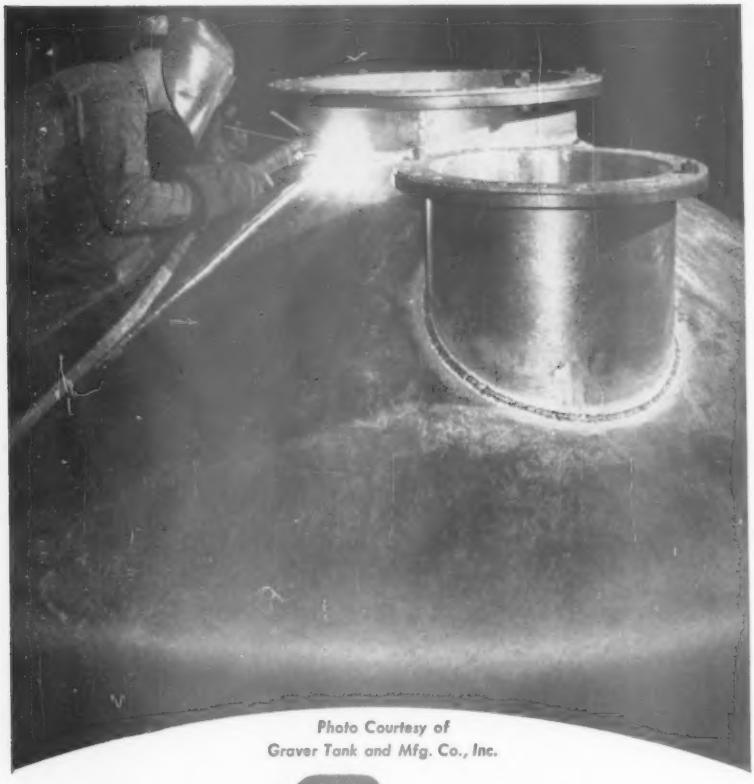


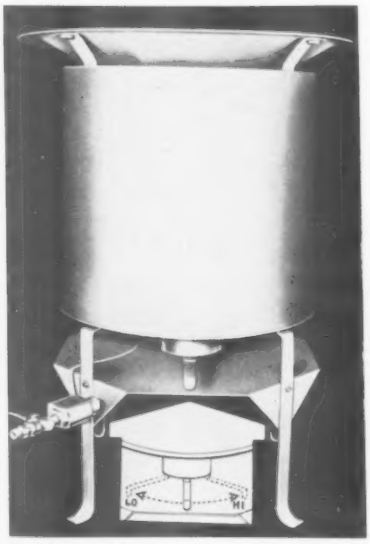
Photo Courtesy of
Graver Tank and Mfg. Co., Inc.

WELD WITH ARCOS

ALUMINUM RODS and ELECTRODES

The inert-gas-shielded-arc process made aluminum welding practical . . . but it takes Arcos quality in aluminum bare wire to assure you the most dependable results possible. Because no flux is used, the chemical analysis and cleanliness of the wire must be within exacting limits. Arcos' long experience with weld metallurgy, plus rigid controls in manufacturing, guarantee this vital factor. Arcos aluminum wire is your best assurance of stronger, more ductile, more corrosion-resistant welds.

ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



Salamander

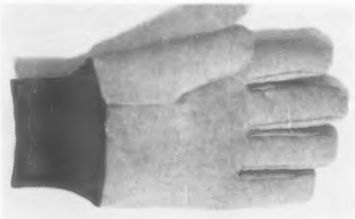
VARIABLE input salamander uses constant pressure. Lever control adjusts from minimum to maximum BTU output. This single burner salamander produces no smoke or soot, manufacturer says. *Weldit, Inc.*

Circle No. 17

Electrode

HEAVILY-loaded iron-powder electrode offers high manual welding speeds, manufacturer says. Designed for downhand welding with either drag or open arc technique, the new electrode will deposit 16 lb or more of weld metal per hour. It is specifically designed for downhand welding of large fabrications such as ship sections, freight cars and tanks. Available in ¼-in. diameter only, electrode is used at currents as high as 500 amp. Welds have ultimate strengths of 60 to 65,000 psi. *Metal & Thermit Corp.*

Circle No. 18



Work glove

THOUSANDS of tiny non-skid plastic dots embedded in a new work glove give it the name—"Mighty-Grip." The tiny dots, molded into the cloth, absorb abrasive wear. The dots are made of a special plastic that grips smooth surfaces, bulky objects and small, odd-shaped parts. *Riegel Textile Corp.*

Circle No. 19

Welding gun

PORTABLE handgun and control for inert gas welding of aluminum and other light gage metals is able to handle filler wire down to 0.020 in. Auxiliaries include wire in one-lb reels, interconnecting cables and hose assembly and portable control unit. *Westinghouse Electric Co.*

Circle No. 20

Plastic apron

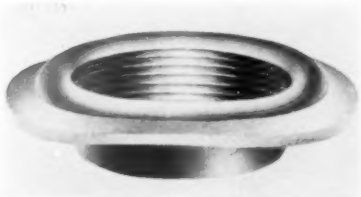
ABLE to withstand temperatures to 300 deg, a new plastic apron resists ageing and is fire-retardant. It won't crack, peel or deteriorate, even when subjected to —35 deg below zero. Plastic sleeves are also available. *Singer Glove Mfg. Co.*

Circle No. 21

Nibbler

JIGSAW puzzle can be cut out of 1/8 in. mild steel with a new portable air-powered nibbler. Used on partially assembled products or on large cumbersome workpieces, this tool handles many jobs. The nibbler eats its way through the material at a 5 to 6 ft per minute clip. *Buckeye Tools Corp.*

Circle No. 22

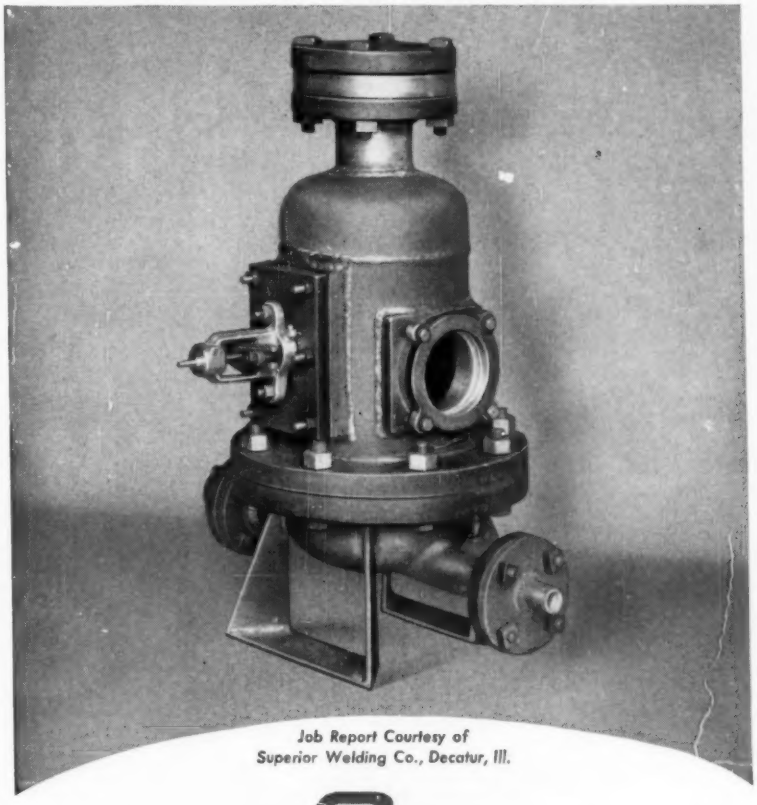


Weld flange

PRESSED-steel welding flanges are made in eight sizes, from 1/4 to 3 in. They weld easily, and are available in brass, copper and stainless. The flanges can be supplied to fit the contour of your product, manufacturer says. Thickness of material is from 10 gage through 3/16 in. Heavy-duty sizes through 4 in. will soon be available. *Tech Products, Inc.*

Circle No. 23

For MORE DEPENDABLE Results When Welding Stainless and Dissimilar Metals



Job Report Courtesy of Superior Welding Co., Decatur, Ill.

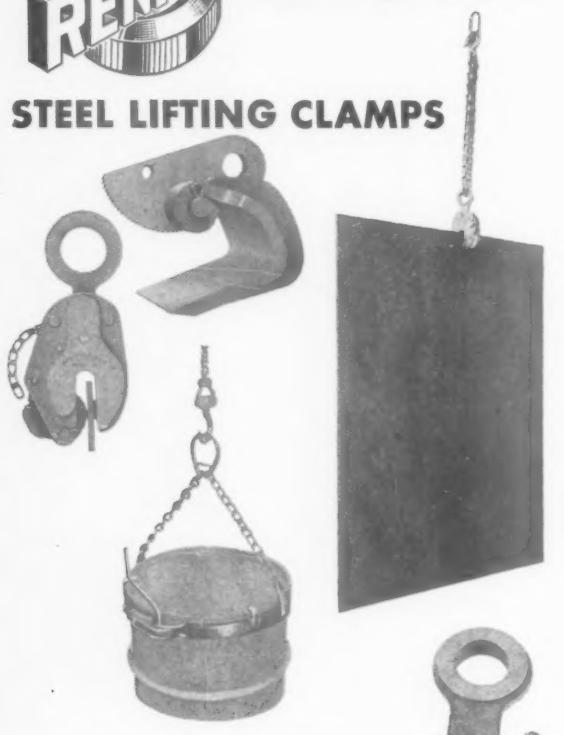
WELD WITH ARCOS

STAINLESS ELECTRODES

This sight flow box is used to check the condition and flow of process chemicals. To assure sound weldments when joining the carbon steel flanges (stainless faced) to the type 316 stainless unit, Arcos 25-20 Mo Electrodes were used. Because of the analysis and uniform ductility of this weld metal, it readily compensated for the unequal rates of contraction of the dissimilar metals. Arcos KMo Electrodes were used to complete the application. Whatever your job, your Arcos representative will have the answer with the right product and know-how. ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.

RENFROE Safety Snap Lock

STEEL LIFTING CLAMPS



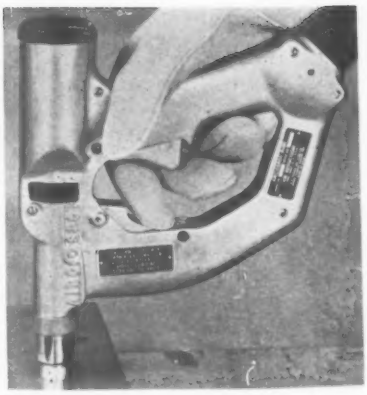
HANDLE STEEL WITH SAFETY

√ Maximum Speed and Safety
√ From ½ ton to 20 ton sizes
√ Lock on in any position
√ Lock off in any position
√ Exceptionally light in weight
√ The toughest clamp ever built
√ Takes the place of welded pad eyes and screw clamps
√ Cannot be accidentally knocked off
√ Safety Factor 5 to 1

A Superior Line of Steel Lifting Clamps designed to meet today's demand for handling steel with maximum SAFETY and EFFICIENCY.

WRITE FOR COMPLETE CATALOGUE

J. C. RENFROE & SONS, INC.
1259 WEST STATE STREET • P. O. BOX 4279
JACKSONVILLE, FLORIDA



Cooling control

CRATER eliminator control functions to regulate automatically the cooling rate of welds. The accessory unit is designed for service with a spot welding gun in the arc-spot welding of light-gage metals. With this unit, the arc does not end abruptly when the trigger is released and welding action stops; instead, its intensity drops to a lower level before it extinguishes. The weld cools more slowly, minimizing weld cracking.

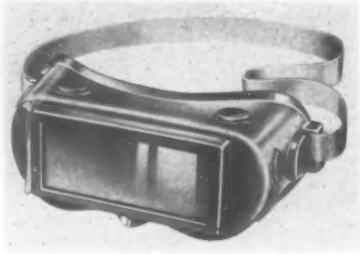
Company's spot gun has been revised by installing a new spatter trap to prevent particles of molten metal from entering the nozzle and an adjustable trigger stop has been incorporated. *Air Reduction Sales Co.*

Circle No. 24

Plastic steel

NEW Devcon WR has been used successfully to build up surfaces and repair chemical equipment, manufacturer says. It is resistant to most acids, alkalies, solvents and chemicals. No heat or pressure is required for hardening, and shrinkage is minimal. *Devcon Corp.*

Circle No. 25



Eye shield

PLIABLE, one-piece, opaque frame of a new eye shield is soft to simplify plate changing. It fits the contour of the face. A slide frame acts as a lens inserter and ejector. Standard filter and shatter-proof, plastic cover plates give maximum protection. *Welsh Mfg. Co.*

Circle No. 26

HOBART

Another Outstanding HOBART Electrode

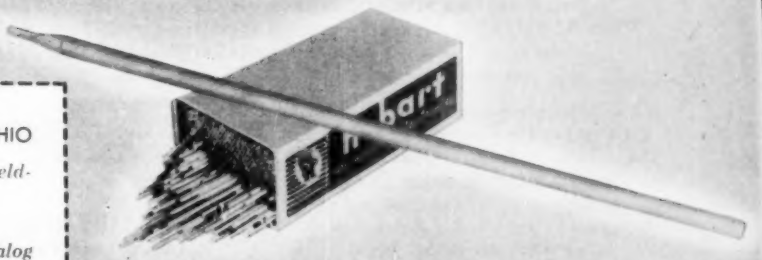
ROCKET "24" DOUBLES DEPOSITION!

SELF-REMOVING SLAG!

A NEW iron powder (mild steel) dc or ac general purpose electrode for horizontal fillet and downhand welding

The new Hobart ROCKET "24" opens a new field for manual welding because of its high deposition rate which doubles that of the conventional E-6012 in most cases. Produces a high quality weld with a finely rippled bead. You get exceptionally low spatter loss and slag is practically self-removing.

Rocket "24" was especially designed for welding as a contact electrode for use with the drag technique which will give you a much faster speed of deposit. It can also be used with the free arc welding method with fine results.



HOBART BROTHERS COMPANY, BOX U-1272, TROY, OHIO

☐ *Yes, I'd be interested in trying this new ROCKET "24" Welding Electrode.*

Also send me the following:

☐ *Complete Electrode Catalog* ☐ *Arc Welder Catalog*

☐ *Weldors' Vest Pocket Guide*

Name _____

Firm _____

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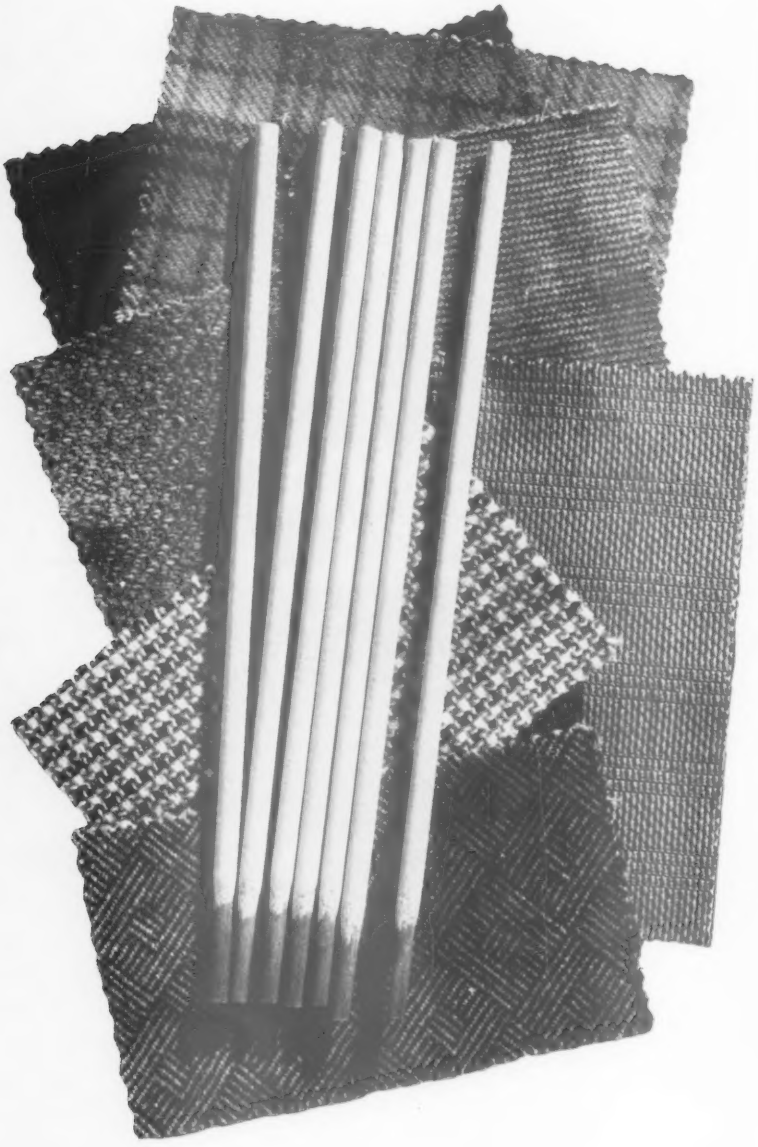
HOBART TROY OHIO **WELDERS**



Rod performance is **IN THE COATING**

COATING FORMULATIONS are the key to electrode performance. When RUFLUX* is used in the coating, it provides several important advantages. The particular advantages depend upon which RUFLUX* products are used.

Manufacturers look to TAM for three types. They are the highest quality Rutiles, Titanates and Zirconium compounds. A TAM sales engineer can give you the facts on any one quickly and accurately while a request to our NYC office will bring you detailed literature.

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NATIONAL LEAD COMPANY
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111 Broadway, New York City
General Offices, Works and Research Laboratories.
Niagara Falls, New York

*Reg. T.M.

Metallic bond

LACK of bond in metallic honeycomb materials can be located with "Bondchek," readily seen on the outside surface. A specially-formulated liquid changes viscosity and surface tension if exposed to heat. The liquid is sprayed on the honeycomb and heat is applied. Bonded partitions act as heat sinks and stay cool, visible components are attracted to these cooler sections. Unbonded partitions heat up and repel the liquid, leaving a clear visible pattern of bonded and unbonded areas. *Magnaflux Corp.*

Circle No. 27

Bending roll

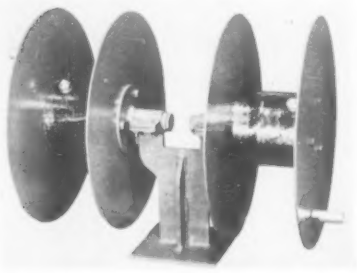
INITIAL-type plate bending roll is built in a range of capacities and sizes from 4 to 10 in. long, ranging from gage sizes through 5/16 in. capacity. Machine incorporates use of totally enclosed worm gears on the adjustment of the rear roll, and cut steel gears throughout with a train of gears on the main drive. *Webb Corp.*

Circle No. 28

Electrode

CHROMIUM-nickel a-c/d-c electrode is for very high alloy steels, tool and spring steels, pressure vessels, air hardenable steels, dies, nickel clad and mild and medium carbon steels. Welded properties include: tensile strength of 120,000 psi, elongation in 2 in., 35%; and 200 Brinell hardness. Deposits cannot be heat-treated, but can be work-hardened to over 180,000 psi tensile. It is an improved version of the No. 275 electrode, manufacturer says. *All-State Welding Alloys Co., Inc.*

Circle No. 29



Cable reel

THIS reel is made for anyone who has an arc welder, the manufacturer declares. It can be used in factories or in the field, and is mountable on a welder as a twin unit. The reel weighs about 40 lb, and is made of 10 gage to ¼ steel. Fully insulated, it has brass and copper fittings and conductors. *Heffner Products.*

Circle No. 30

P&H

All standard models give 360° rotation, full 135° tilt, and full elevation even under capacity loads

Your **biggest** saving in welding is in weldment **handling**

P&H Welding Positioners often cut costs up to 43% by making weldment handling easier.

They raise, rotate, and tilt weldments up to 100,000 pounds, completely freeing operators from the time-consuming, hazardous job of repositioning weldments on the floor.

RESULT: Increased production, less operator fatigue, metal flows more readily, pools more evenly to produce cleaner, stronger welds — because all welding is done in the natural *downhand* position.

For more information about how these useful machines can save you money, write to Department 305B, Harnischfeger Corp., Milwaukee 46, Wis.

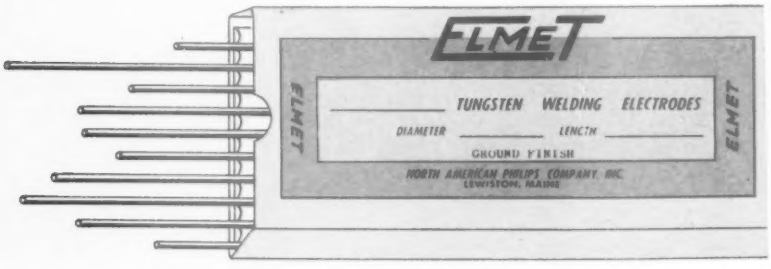
HARNISCHFEGER

P&H WELDERS • ELECTRODES • POSITIONERS
MILWAUKEE 46, WISCONSIN

ALIKE AS TWO ELMET ELECTRODES

Nature does it without even trying, but on the production line it takes a lot of human skill to attain absolute uniformity. In the making of Elmet tungsten electrodes, however, the result is well worth the extra effort. For Elmet electrodes are completely uniform, not only in surface finish and dimensions, but more important, in their composition, characteristics and physical structure. This means that, with Elmet, you get consistently superior pertormance from electrode to electrode with a minimum in readjustment of equipment and voltage.

Elmet pure tungsten and thoriated tungsten electrodes are furnished in cleaned finish and in the mirror-smooth centerless ground finish. They are available in packages of 10 in all standard diameters from .040" to ¼" and from 3" to 18" in length.



Why not place a trial order with your distributor today, or use the coupon below to obtain full information and an informative folder on tungsten electrode welding.

NORTH AMERICAN PHILIPS COMPANY, INC., Elmet Division, Lewiston, Maine

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We are a Distributor ☐ User ☐

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Cover goggles

CONVENTIONAL deep-frame goggles have been converted to a soft, pliable plastic to conform to the contours of the face and head. Goggle fits over prescription glasses. Available with standard shatterproof CR39 filter lenses or heat-treated filter lenses (on request.) *Welsh Mfg. Co.*

Circle No. 31

Electrode

HEAVILY-loaded iron-powder electrode offers high manual welding speeds, manufacturer says. Designed for downhand welding with either drag or open arc technique, the new electrode will deposit 16 lb or more of weld metal per hour. It is specifically designed for downhand welding of large fabrications such as ship sections, freight cars and tanks. Available in ¼-in. diameter only, electrode is used at currents as high as 500 amp. Welds have ultimate strengths of 60 to 65,000 psi. *Metal & Thermit Corp.*

Circle No. 32

Brazing flux

HIGH temperature flux, for brazing steel, stainless, nickel alloys, high temperature alloys, copper, tungsten and chromium carbides with silver brazing alloys, is active between 1,100 and 3,000 F. It is for use with torch, induction, air-gas or furnace brazing. Fluidity temperature is reached at 900 F; remains active up to 3,000 F. Flux is particularly useful where extra oxidation resistance is required. *American Products Corp.*

Circle No. 33

Wheel dresser

AUTOMATIC, hydraulic operation with dressing accuracies within a tenth are possible with a new hydraulic contour wheel dresser, manufacturer says. For use with cylindrical grinders, the unit will dress any angle on the wheel perpendicular as well as horizontal. It can undercut grinding wheels and can dress at uniform peripheral speed. Model 89 is available with precision-computed templates for profile widths up to 6 in. and depths up to 3½ in. *Hoglund Engineering & Mfg. Co., Inc.*

Circle No. 34

New LW-3

Only 14 ozs.

HI-AMP®

Presents America's Newest, Lightweight,

Most Practical Aluminum Holder.

Light
Cool
Efficient
Economical

Designed with **HI-AMP'S** channel construction which insures rugged tong members, made from Kaiser Forged Aluminum for high tensile strength with replaceable jaws of tough **LENCO-LOY.**

High heat resisting glass fibre insulation that withstands rough treatment giving long service life. Insulation does not absorb moisture and insulates from heat as well as electrically. Insulating parts are interchangeable with **HI-AMP'S** popular Model F-3 heavy duty copper alloy holder.

Welding Cable connection uses two socket set screws with clamping plate to insure uniform pressure throughout length of welding cable contacting the holder.

Low Trigger design gives better balance for manual arc welding, reducing operator fatigue to a minimum.

Rated in top preference position by experienced welders who demand light weight, cool operation and long service life.

Sold through Welding Supply Dealers throughout the World.

LENCO, Inc. JACKSON, MO.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

AN AIR REDUCTION PRODUCT

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 150 East 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

THIS IS LOW COST WELDING!

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal—giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding—constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt, and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

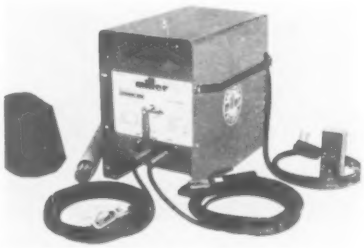
Write for the new C-F Positioner Catalog

CULLEN-FRIESTEDT CO.

1302 S. Kilbourn Avenue Chicago 23, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds



Utility welder

FARM and general-utility type welder features new movable shunt regulator, two welding current ranges, extra-heavy gage steel body with baked enamel finish. Carrying handles make the 137 lb machine portable. Standard equipment includes 6 ft of 3-conductor primary cable with 3-prong plug and wall receptacle; 20 ft of No. 4 electrode cable with electrode holder; 15 ft. of No. 4 ground cable with clamp; welding helmet and 5 lb of assorted electrodes. *Miller Electric Mfg. Co., Inc.*

Circle No. 35

Work holder

COMBINATION of two new tools, light-duty vise and new model work positioner, can be used on benches, pallets or conveyors to save tooling cost and labor. Vice has moveable jaw which travels on gibs machined to close tolerances, providing a tight, smooth action. Positioner has a work-weight capacity of up to 15 lb. Maximum jaw opening of the vise is 2¼ in., jaw depth is 1⅛ in. and width is 2¼ in. *Wilton Tool Mfg. Co., Inc.*

Circle No. 36

Impulse monitor

NEW impulse monitor automatically provides for shutting down an electric salt bath heat treating furnace if control instrument or relay failure occurs. *Harry P. Bridge Co.*

Circle No. 37

Strip coating

TRANSPARENT, tough film for protecting smooth and wrinkled metal finishes is obtained with high solids, milky colored, plastic emulsion strip coating. "Strip-Kote" is applied by brush or spray gun. When dry, it is flexible and easily removed. *Chemical Consulting Service.*

Circle No. 38

Ceramic fixtures

DIP-soldering fixtures, made from a ceramic, allow automatic dip-soldering of printed circuit boards. The ceramic is suitable for temperatures to 1,065 C. *Technion Design & Mfg. Co., Inc.*

Circle No. 39

Flux

INTRODUCED directly into the fuel gas, a new "flame-flowed flux" sets a protective cover over the metal during brazing and welding to prevent oxide or discoloration. No special torches or tips are needed, manufacturer says. A liquid flux vaporizing unit attached to the fuel gas line is the only required installation. *Vap-R-Flux Corp.*

Circle No. 40

Spray applicator

USED for flame spray application of fused hardfacing alloys, the "Spray-welder" features a new high-capacity spraying nozzle. The applicator is also used for metalizing application of a variety of metal powders. *Wall Colmonoy Corp.*

Circle No. 41

Asbestos

WELDING blankets and curtains are being made from a new, blue, pure asbestos. It has no fillers, is resistant to fire and heat and offers increased resistance to acids, caustics and other corrosives, manufacturer says. *Singer Glove Mfg. Co.*

Circle No. 42

Toggle clamps

AIR-operated toggle clamps can be used in smaller assembly operations. Clamping and unclamping is triggered by valve lever. *Detroit Stamping Co.*

Circle No. 43

Gloves

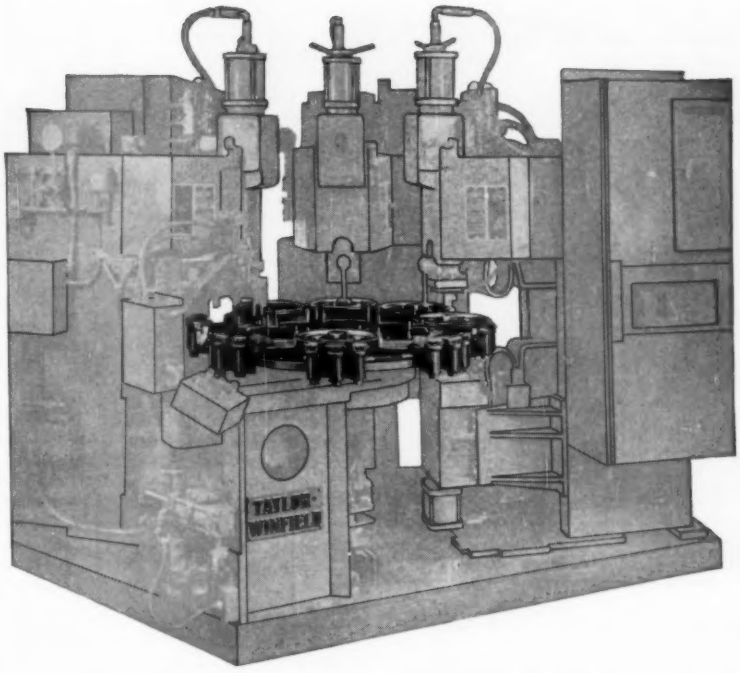
WELDING gloves may be purchased with printing on them to identify the shop, or maybe caution the weldor to work safely. A line of industrial gloves is available with any desired printing on the back. Many styles are available. *Riegel Textile Corp.*

Circle No. 44

Electronic testing

NONDESTRUCTIVE electronic-testing instruments include: conductivity meter for measuring hardness, purity, sorting mixed non-magnetic metals and determining uniformity of heat treat; ultrasonic instruments for thickness measuring; a unit to inspect non-magnetic rod, tube and wire in production; electronic crack detector designed to find defects in spark plug ports of aluminum aircraft cylinders; precision magnetic field meter and the new test unit which automatically evaluates and sorts magnetic materials for alloy composition, heat treat condition, depth of case and carbon content. *Magnaflux Corp.*

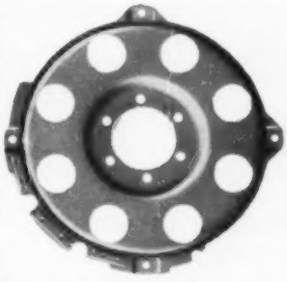
Circle No. 45



T-W Mechanized Handling Triples Standard Weld Production

Three standard projection welders, mounted around a rotary index table, assemble automobile flex-plates at 600 per hour. In service, this flex-plate connects the automobile flywheel to the crankshaft.

One operator loads three counterweights and a flex-plate on an index table fixture. The machine automatically indexes and welds the weights to the plate at three separate stations. The operator loads continuously and assemblies are unloaded automatically.



Flywheel Flex-Plate

Your use of specially-arranged standard welders readily permits modification, if required by future product design changes. Contact the nearest T-W office for prompt attention to your weld production requirements.

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WARREN, OHIO

ELECTRIC RESISTANCE AND ARC WELDING MACHINES

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DAYTON • DENVER • DETROIT • LOS ANGELES • PHILADELPHIA
PORTLAND, OREGON • ST. LOUIS • STAMFORD
OAKVILLE AND WINDSOR, ONTARIO

ABOVE: This new straight-line production plant was recently opened in Philadelphia by Arcflux Corp., a subsidiary of Arcos Corp. (See story below.)

LEFT: These French engineers went underground—to the Paris Subways—to earn the $1,500 Gregory Award for the year's most outstanding contribution to the advancement of electric arc stud welding. Shown here alongside a section of the Paris "Metro" track, they used stud welding to save 68% ($85,600) in the cost of converting the track for use by rubber-tired subway trains. On p. 38, WELDING ENGINEER details the prize winning paper. Left to right: Maurice L. A. Faure, Jean H. Loubignac and Charles Lechartier.

NEWS . . . . . *from page 6*

sign of machines improved through the use of arc welding.

A total of 26 awards were made in the competition—one of a series designed to advance the progress of welded machine design.

The $4,000 second prize went to George Volin, design engineer for E. D. Jones & Sons, Pittsfield, Mass., for his design of a new type of paper pulp refining machine. Leighton W. Johnson, chief engineer for Gunderson Bros. Engineering Corp., Portland, Ore., won the $3,300 third award for his portable gang saw used in the lumber industry.

Engineers from 13 different states collected a total of $25,000 in awards. Designs included machines in the textile, paper, lumber, construction, electronic, plastic, ceramic and metal-working industries.

Welding materials in Inco display

At the 26th Annual Exposition of Chemical Industries in the Coliseum, New York, Dec. 2 through 6, International Nickel Co. will feature welding materials, nickel alloys, platinum and metals and catalysts.

Wheelabrator Corp. gets Canadian branch

Wheelabrator Corp., active in the Canadian market for the last 12 years, is establishing a Canadian Div. with a new plant in Scarborough (Metropolitan Toronto), Ont.

The plant will house the firm's Canadian division sales and general offices, warehouse storage and shipping for Wheelabrator airless blast cleaning equipment parts, dust collector parts and steel abrasives. Robert A. Campbell, Canadian district manager since 1946, is general manager of the division. Wheelabrator headquarters in Mishawaka, Ind.

ACCO purchases X-ray generator

To search, by X-ray, for internal flaws in heavy castings, weldments and machined parts, a 2,000,000-volt Van de Graaff radiographic X-ray generator has been purchased by American Chain & Cable Co., Reading, Pa. The division manufactures special valves for high pressure and high temperature applications.

High Voltage Engineering Co., Burlington, Mass., makers of the huge generator, featured a working scale model of the X-ray generator at its booth at the National Metals Exposition.

WRC grants $4,500 to Rensselaer

Research on the embrittlement of metals by hydrogen will be furthered with $4,500 granted to Rensselaer Polytechnic Institute by the Pressure Vessel Research Committee of the Welding Research Council. The research project will be directed by Dr. H. C. Van Ness, associate professor of chemical engineering.

Joseph B. Honnigford of Evansville, Ind., is now working under this grant. He received a B.S. in chemical engineering at Purdue University last June, and is now going for his master's at the Troy, N. Y., school.

Arcflux opens new Philadelphia plant

Arcflux Corp., a subsidiary of Arcos Corp., recently opened a new straight-line production plant in Philadelphia to increase production of stainless steel and low-alloy-steel submerged-arc welding fluxes.

R. D. Thomas, Jr., Arcflux president, said that the new 15,000 sq ft plant will more than double present production facilities. The modern, one-story brick building is being equipped with mixers and kiln dryers. In order to keep a constant check on quality of the fluxes, the newest type submerged-arc welding equipment is being installed. It will be used for quality control and as a customer service.

66 speakers featured at maintenance show

The Plant Maintenance & Engineering Conference will attract 66 speakers for its 25 sessions. The conference will be held the first three days of the Plant Maintenance & Engineering Show at the International Amphitheatre in Chicago, Jan. 27 to 30.

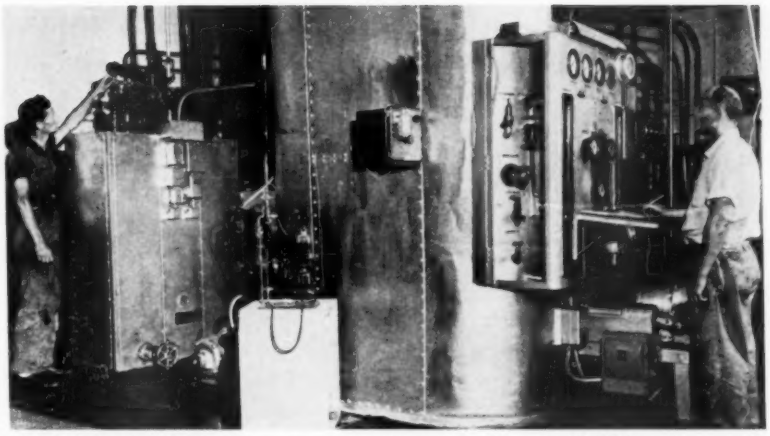
Crucible Steel wins reserve coal rights

More than 15,000 surface acres of coal reserves will yield over 20 million tons of high volatile metallurgical coal to Crucible Steel Co., Charleston, W. Va. Along with present holdings, the Hugheston, W. Va., acreage assures the firm a 40-year supply at present consumption rates.

Sylvania changes division name

The Tungsten and Chemical Div. of Sylvania Electric Products Inc. is now called the Chemical and Metallurgical Division. "Sylvania changed the name to provide a clearer indication of the broad line of products manufactured," according to Marion E. Pettegrew, vice president of operations of the firm. The division has two plants, one in Towanda, Pa., and the other at Troy, Pa.

Ceramic manufacturing operations of Sylvania at Mineola, N. Y., have been made a unit of the Parts Div. Manufacturing will be expanded to include a wide variety of precision ceramic parts and vacuum-tight ceramic-to-metal composites.



RECENTLY installed 60-meter oxygen column produces 1,500,000 cu ft a month for Delta Oxygen Co., Inc., of Memphis, Tenn. The new unit has increased Delta's oxygen production capacity by 100%, to 3,000,000 cu ft a month. Delta, which operates branch offices and warehouses in Mississippi, Arkansas and Kentucky, also produces acetylene, hydrogen, nitrogen and CO_2.

Ceramic tooling taught at training school

What are the best methods for using high temperature ceramic tooling? Technion Design & Mfg. Co., Inc., New York, is attempting to answer this question with a training school set up for production personnel. The course, offered free to production engineers and manufacturing personnel in New York City, covers such topics as: how to correctly design ceramic tooling, how to machine ceramic tooling, how to make low-cost ceramic tools, how to correctly fasten ceramics.

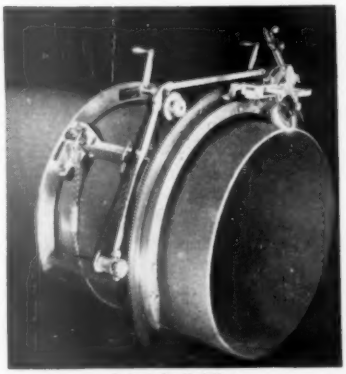
High temperature ceramic products are used to solve fixture and tooling problems in brazing, welding, sintering, soldering, heat treating and heat forming.

Atomic forum held in New York

The theme of this year's Atomic Industrial Forum was "The 1957 nuclear industry, problems and progress." Held in New York City Oct. 28 to 30, the program included a special reactor safety conference Oct. 31.

Pat. 2408517

SHAPE CUTTER



Patent Applied For

OUT•OF•ROUND

Torch control

FOR PERFECT CUTS AND BEVELS

For improved control of accuracy and precision in pipe cutting and beveling, H & M now offers the *new and improved* Out-of-Round Attachment — plus the H & M Shape Cutter.

The new Out-of-Round features greater accuracy, simplicity and ease of operation in cutting pipe, where the circumference of the pipe is of imperfect shape.

The Shape Cutter makes the most complex intersectional cuts precise and accurate by using a proven pattern or templet.

In both cases, the torch is forced to follow a predetermined course that you *know* is perfect.

Both the Out-of-Round and the Shape Cutter are available in sizes to fit any of the standard H & M Pipe Cutting and Beveling Machines. Illustrated bulletins are yours upon request.

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FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

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FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

FUSE-WELL NO. 14 MOLY

FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

Sold through Leading Distributors

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
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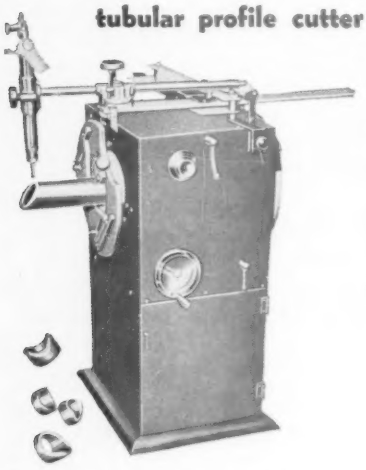
tubular profile cutter



It's versatile! You can make all types of precision flame cuts on pipe or tubing with this machine, angles, miters, saddles, bevels, spiral slots, notches, cams, serrations, and many different shapes or profiles.

See your welding supply dealer, or write direct for descriptive folder.

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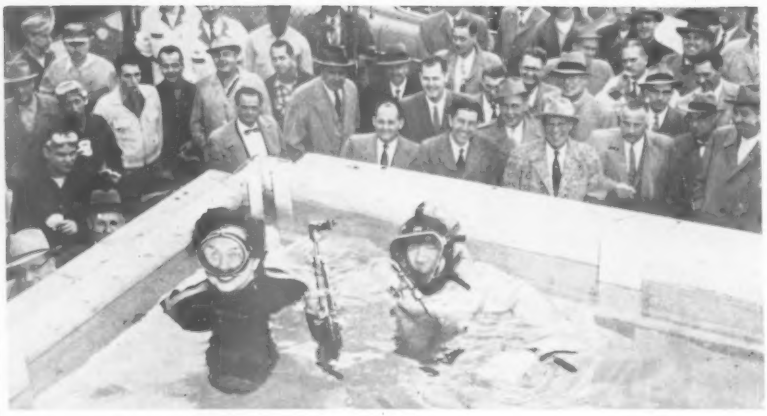
WICHITA KANSAS



Underwater act staged for IOMA

Underwater diving and cutting gear was demonstrated for delegates to the Independent Oxygen Manufacturer's Association's recent three-day convention in Chicago. Greer Shop Training, Inc., arranged the exhibition, with help from the U.S. Navy, who supplied equipment and diver James Hughes, shown here surfaced with skin diver Fran Sheets who is holding a RegO underwater cutting torch.

When a chilly day threatened the success of the outdoor diving show, Greer solved the problem by heating the water in the 5,000-gallon diving tank with an engine-driven welder's hot exhaust gases piped through the water. IOMA members touring the Greer school saw special welding demonstrations in progress.

James M. Kane, from National Cooler Corp., Cleveland, addressed one of the IOMA sessions held at Chicago's Edgewater Beach Hotel. New officers elected were: C. W. Steele, Steele Gases, Inc., president; John Coyne, California Oxygen Co., vice president; T. M. Keane, Sierra Oxygen Co., secretary; Walter Keenan, Keenan Welding Supply, treasurer.

AWS officers tour Texas

C. P. Sander, president of the American Welding Society, and Fred L. Plummer, national secretary, recently visited AWS sections and divisions in Texas. President Sander talked of the approaching 1958 Annual Meeting and Exposition scheduled for St. Louis in April. Double the required number of technical papers have been submitted for the meeting, President Sander reported.

Plummer, in several addresses, covered such subjects as fabrication and welding problems in construction of large storage and process vessels made of plates of mild steel, stainless steel, aluminum, and nickel alloys.

Gulton moves into Canada

With its acquisition of Titania Electric Corp. of Canada, Ltd., Gulton Industries expands into Canada. Included in the purchase of the Gananoque, Ont., firm is a factory building and equipment and a 30-acre industrial tract. Titania will operate as a wholly-owned subsidiary.

Inco establishes Columbia U. chair

The International Nickel Co. has established a chair in chemical metallurgy at Columbia University. The endowment totals $350,000. Inco explained that it wishes to support research in the surface chemical and physical aspects of problems in metallurgy.

Mueller gives Cleveland new planetarium

Because of Ralph Mueller's interest in public education, Cleveland's Museum of Natural History will include a new planetarium. Mueller, senior partner of Mueller Electric Co., will sponsor the building of the planetarium, which will house the Spitz projection apparatus and will seat 125. It will be called the Ralph Mueller Planetarium.

Norton adds to Canadian plant

Norton Co. has begun construction of an addition to its Cap-de-la-Madeleine, Quebec, silicon carbide processing plant which will increase output capacity by 25 to 40%, the firm reports. The new facilities should be in operation by the end of the year.

Raidy, Walter launch new firm

Ralph Raidy and Cal Walter, formerly with Gasflux Co., have formed a new firm—Vap-R-Flux Corp., Mansfield, Ohio. Walter is president and Raidy is vice president in charge of sales. The firm manufactures a new flame-flowed flux which is introduced directly into the fuel gas. Charles P. Feebusch of Chicago has been retained as consulting engineer.

A. O. Smith promotes Milwaukee division

A. O. Smith Corp. has enlarged and given divisional status to its Milwaukee plant tooling facilities. Manager of the new Tool and Manufacturing Div. is Elmer A. Widerborg. Tooling operations formerly were part of general plant service activities, which Widerborg headed. Plant services will be taken over by John P. Mason.

Teachers plus Zero equal education

Zero Mfg. Co. played host to 10 high school teachers at its Burbank, Calif., plant recently, as part of a Business-Education week exchange of ideas. Zero President Jack Gilbert showed the educators through the plant where components of electronic units are deep-drawn and fabricated from aluminum. Vice President T. C. Combs points out details of roll-seam welding on aluminum telemeter housing.

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Seldom cost as much as 1% of savings made!

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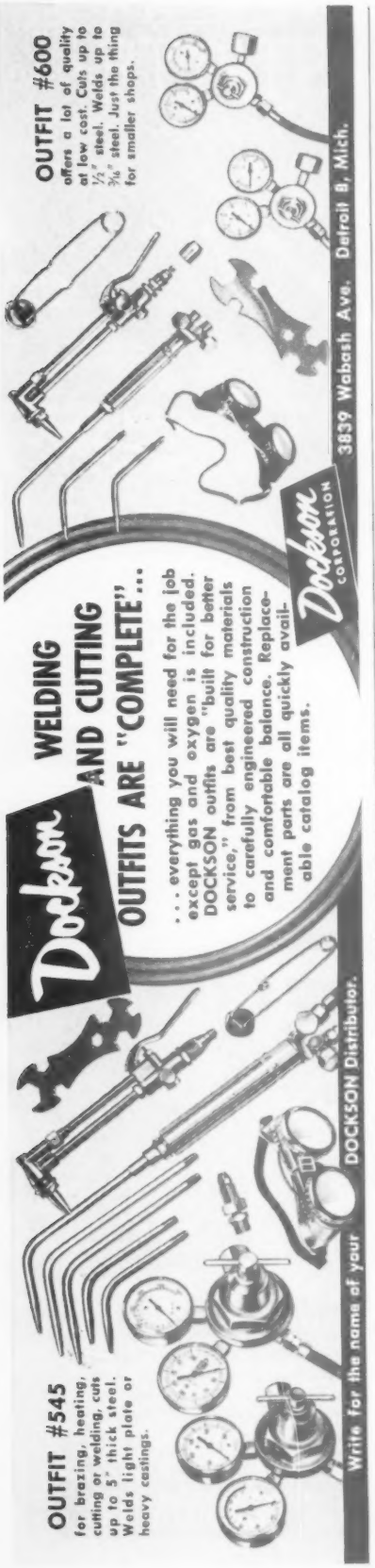
OUTFIT #600
offers a lot of quality at low cost. Cuts up to ½" steel. Welds up to ¾" steel. Just the thing for smaller shops.
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WELDING AND CUTTING OUTFITS ARE "COMPLETE"...
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for brazing, heating, cutting or welding, cuts up to 5" thick steel. Welds light plate or heavy castings.
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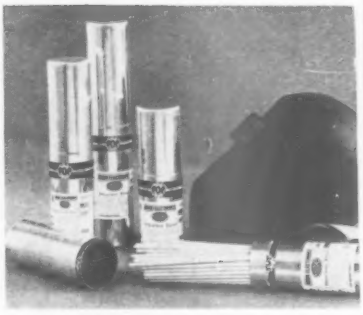


Airco scores packaging first

Shops that use Airco stainless steel electrodes will soon be popping . . . literally. Airco is the first to package electrodes in aluminum cans. The seamless, two-piece container seals the electrodes from dampness and moisture; the pop is heard when the top of the container is removed. Airco's move represents one of the first commercial uses of aluminum cans in the U. S.

Kaiser Aluminum's newly-developed technique produces the seamless can body and bottom in one piece. There is no danger it will lose its hermetic seal, Kaiser reports. The cans are 2¾ in. in diameter and come in three different sizes to accommodate different electrode lengths.

Crucible to get new research lab

A new Applied Research laboratory will be located at Crucible Steel Co.'s Sanderson-Halcomb Works in Syracuse, N. Y. Dr. A. M. Aksoy is manager of the new laboratory, which will operate as an extension of Crucible's central Research and Development Dept. in Pittsburgh.

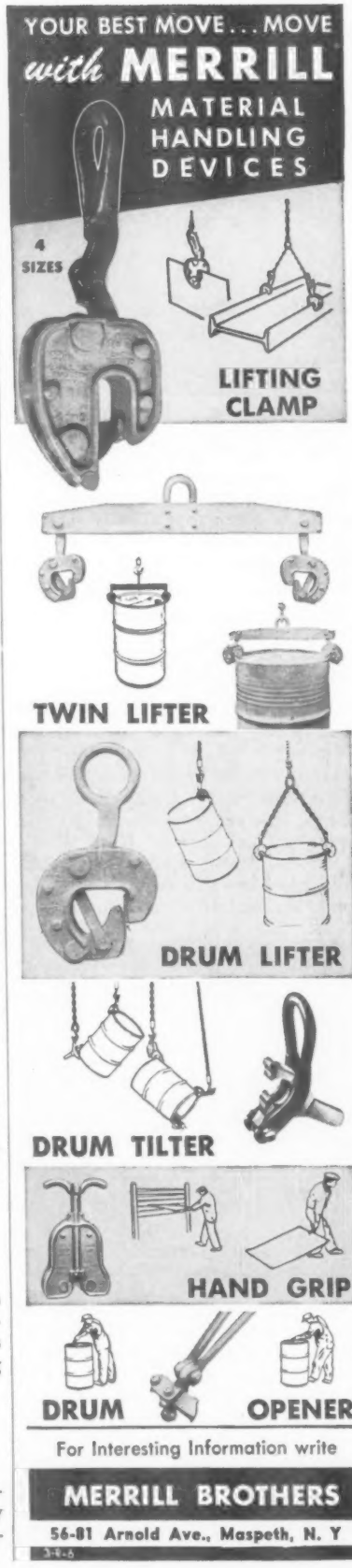
The laboratory will be "a center for research of an experimental and developmental nature in the fields of metals melted in air, vacuum or special atmospheres," Joel Hunter, president of Crucible Steel, said.

Norris-Thermador stores cylinders in Waco

Norris-Thermador Corp. of Los Angeles is now warehousing acetylene cylinders in its Waco, Texas plant. CO_2 cylinders are also being stored in the Waco plant.

CGA elects Colonial Gas

Colonial Gas Holdings Ltd., Melbourne, Australia, was recently chosen for membership in the Compressed Gas Association.



COMING EVENTS

DEC. 2-3: NWSA Southeastern Zone Meeting, Atlanta Biltmore, Atlanta.

DEC. 5-6: NWSA Southeastern Zone Meeting, The St. Anthony, San Antonio.

JAN. 27-30: Ninth National Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

JAN. 29-30: Midwest Welding Conference, Chicago.

FEB. 10-14: American Society for Testing Materials committee week, Hotel Statler, St. Louis.

MARCH 17-21: 1958 International Atomic Exposition trade show in conjunction with 1958 Nuclear Congress, International Amphitheatre, Chicago.

MARCH 19-21: Fifty-eighth Annual Convention, International Acetylene Association, Bellevue Stratford Hotel, Philadelphia.

APRIL 14-17: Sixth Annual Welding Show, American Welding Society, Statler and other hotels, St. Louis.

APRIL 14-18: Sixth Spring and Thirty-ninth Annual Meeting, American Welding Society with American Society of Mechanical Engineers Conference, St. Louis.

MAY 5-8: Fourteenth Annual Convention, National Welding Supply Association, Americana Hotel, Miami Beach, Fla.

JUNE 22-27: American Society for Testing Materials, Hotel Statler, Boston.

American Silver adds new division

American Silver Co. has added a new division for toll-rolling unusual metals and alloys such as zirconium, columbium, tantalum and others in ultra-thin gage or extremely high tolerance metal strip. The toll-rolling division of the Flushing, N. Y., firm includes annealing and slitting facilities. Strip of all kinds is rolled to thicknesses as low as 0.0005 in., to tolerances as close as plus-or-minus 0.0001 in.

Distributor appointments

All State Welding Alloys Co., Inc., White Plains, N. Y.: Gordon Duff, Inc., Los Angeles.

Amperex Electronic Corp., Hicksville, N. Y.: Mel Pearson and Co., Denver, Colo.

A. O. Smith Corp., Milwaukee: Burdett Oxygen Co., Cleveland.

Miller Electric Mfg. Co., Appleton, Wis.: Victor Equipment Co., San Francisco.

Olin Aluminum, Div. of Olin Mathieson Corp.: Lafayette Steel & Aluminum Corp., Chicago.

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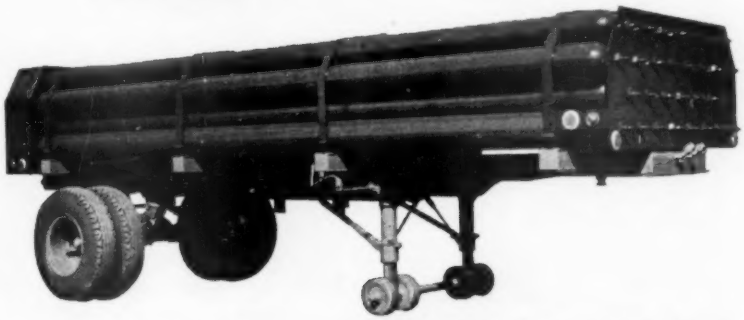

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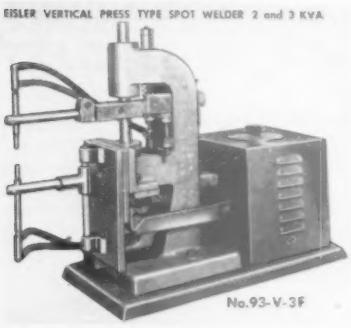

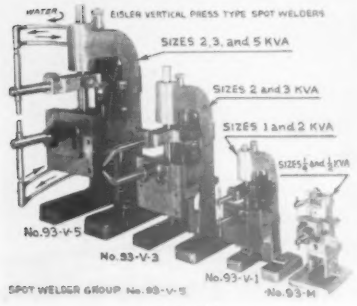

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Frank P. Trecot has been appointed district engineer for Eutectic Welding Alloys Corp., Flushing N.Y. He will be a field representative in the North Detroit, Mich., area.

Smith

Flint

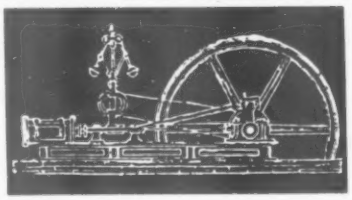
Former west coast district manager for Tweco Products, Inc., *Glenn Smith*, has been transferred to the general office in Wichita, Kan. He will serve in the sales promotion and advertising department. *Fred W. Flint* is new California district representative for the firm.

D. L. Brown has been appointed to the sales and service staff of the Welder Service Co., Toledo, Ohio.

Hotte

Paul Hotte has been named general sales manager of the Mallory Metallurgical Div., P. R. Mallory & Co., Inc., Indianapolis, Ind. He will be assisted by *J. L. Nichols*, *A. O. Braun* and *D. J. Smith* as Eastern, Central and Midwestern sales managers, respectively. A parallel organization has been established for the firm's Electronic Div., with *T. M. Fitzgerald* as general sales manager, assisted by *B. W. Chandler* as Eastern regional sales manager and *R. H. Andrew* as Central regional sales manager.

New purchasing agent for A. O. Smith Corp.'s Granite City, Ill., plant is *Carl J. Bliemeister*. He was with the firm's central purchasing organization in Milwaukee.



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A former plant supervisor for Sciaky Bros. Western Research Div., *Fredrick R. (Ray) Koepenick*, has been elected president of Electronic Welding, Burbank, Calif. An active member in the Los Angeles section of AWS, he was also a resistance welding engineer with Boeing Airplane Co. in Seattle.

Edward F. Kurzinski joins Air Products, Inc., Allentown, Pa., as manager of sales development engineering. He will assist ferrous and nonferrous metal industries in problems in the use of oxygen and other industrial gases. He was previously with Linde Co.

Charles W. Marr has been appointed sales representative at the Pittsburgh office of Westinghouse Electric Corp.'s welding department. He will keep customers up-to-date on the firm's new welding products and techniques and will advise customers with welding problems.

Former advertising manager, *E. J. Doucet* has been advanced to director of advertising and public relations for Vickers, Inc.

Bruce C. Ferguson has been appointed factory representative in the Midwest for United Specialties, Inc., El Dorado, Ark.

Calhoun

Twigg

J. K. Calhoun has been promoted to sales manager in charge of the high pressure gas equipment division for Bastian-Blessing Co.'s RegO Div. He will oversee sales of gas welding and cutting equipment, gas plant equipment, cylinder valves, manifolds, oxygen therapy equipment and custom-made equipment. Calhoun has been with Bastian-Blessing for nine years. He is a director of the Chicago section of AWS. *John A. Twigg* is assistant sales manager of the division.

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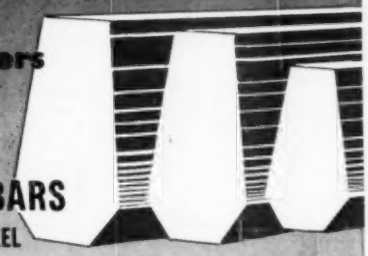

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R. G. Tressler, formerly with General Electric's welding department, has joined the sales staff of Fibre-Metal Products Co. at Chester, Pa.

Tressler

McNally

James P. McNally is product manager of the new Arcflux Corp. plant, Philadelphia, a subsidiary of Arcos Corp.

Donald C. Giles, former branch manager of Pure Carbonic Co.'s Seattle district, has been named district manager at Berkeley, Calif. Giles has been with the division of Air Reduction Co. since 1946.

Died . .

Dr. Paul Dyer Merica, 68, retired president of International Nickel Co. of Canada, died Oct. 20 in Tarrytown, N.Y., following a heart attack on Oct. 18. Dr. Merica was a director of International Nickel Co. of Canada, Ltd., its U. S. subsidiary and of American Metal Co., Babcock & Wilcox and Whitehead Metal Products.

Miss Marguerita M. Kelly died of a heart attack Oct. 22. Miss Kelly served the American Welding Society for more than 30 years, most of this as national secretary, until her retirement in 1949. Miss Kelly was probably associated with the welding industry longer than any woman in the world. She was secretary to Comfort A. Adams, first AWS president. In 1919, when the welding committee of the Emergency Fleet Corp. became the AWS, Miss Kelly became secretary of the society.

Herbert H. Hose, 54, died of a heart attack while on vacation in Arbor Vitae, Wis., Sept 24. For the past 14 years Mr. Hose has been a welding engineer for Ampco Metal, Inc. Before that he was in Harnischfeger Corp.'s welding division.

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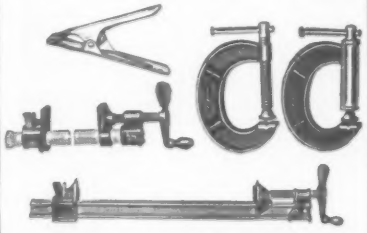

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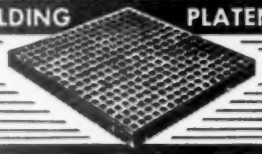

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51. ELECTRODE SELECTOR—Metal & Thermit Corp. Simplified reference for selection, description and identification of the correct electrode for any application.

52. POCKET GUIDE—Hobart Bros. Co. "How to get better welds" is 60-page pocket guide EW-201 on arc welding. Includes information on metals, electrodes, welding procedures, fillet weld, types of joints, welding symbols, etc.

53. DATA BOOK—Eutectic Welding Alloys Corp. 180-page 1958 edition of pocket-sized welding data book TIS 2575A with welding procedures for every base metal.

54. WELD KIT—Lincoln Electric Co. Leaflet explains "do-it-yourself" weld kit using "Lincwelder 100." Shows some home applications, details kit.

55. HARDFACING—Union Carbide Corp. 8-page booklet describes chemical composition, properties, applications and procedures for using 11 alloys.

56. FLUX—Vap-R-Flux Corp. New firm tells of its flame-flowed flux in an illustrated sheet. Flux is for brazing with bronze rod and silver solders.

57. BACKING RINGS—Robvon Backing Ring Co. Illustrated sheet includes specifications of firm's line of backing rings.

58. ELECTRICAL CONNECTIONS—Erico Products, Inc. 104-page catalog features new electrical connection types, and has new numbering system.

59. ALLOY CHART—Whitehead Metal Products Co., Inc. Alloys selector chart lists information on 21 Alcoa aluminum alloys and specialty items.

60. BUYERS GUIDE—All-State Welding Alloys Co., Inc. 32-page booklet on rods and electrodes with data to guide choice of alloys and fluxes when working on steel, aluminum, aluminum alloys, etc.

61. GENERATOR—Aeroprojects Inc. Illustrated page details small hand model generator, designed for extremely small soldering applications such as in transistor field.

62. IRRADIATOR—Budd Co. Bulletin introduces model A "Hotrodder," self-contained cobalt 60 irradiator for research studies on effects of ionizing radiation on metals, etc.

63. ATOMIC ENERGY—National Lead Co. "Atomic Energy Materials" is an attractive catalog, edition 2, describing basic materials for the atomic energy industry.

64. BERYLLIUM OXIDE—Beryllium Corp. Booklet describes beryllium oxide, includes tables with typical analysis, standard size crucibles, etc.

65. BLAST CLEANING — Wheelabrator Corp. 34-page brochure, No. 105-D "Special cleaning problems solved," shows airless blast cleaning in specific applications.

66. TURNING ROLL—Aronson Machine Co. Bulletin TR57 features variety of tank turning rolls, pipe rolls and rail cars for positioning cylindrical vessels for automatic welding.

67. SEAMLESS TUBING — Babcock & Wilcox Co. Bulletin TB-340A is a guide to the choice of seamless mechanical tubing.

68. FILM BADGE—Tracerlab, Inc. Folder describes complete film badge services of firm. Includes types of personnel protection badges—X-ray, neutron, beta-gamma.

69. SOLAR TECHNOLOGY—Solar Aircraft Co. 14-page brochure titled "Solar Advanced Technology" describes the firm's products, services and facilities.

70. ALUMINUM—Reynolds Metals Co. Technical booklet on the use of aluminum for tanks and vessels is guide to design, fabrication and applications of aluminum tanks and vessels.

71. MOTOR CONTROL—Allis-Chalmers Mfg. Co. Bulletin 14B8507, "Type H Motor control," covers design features in front access, high voltage starters for 2,300 to 5,000-volt motors.

72. AUTROMETER—Philips Electronics, Inc. 8-page booklet includes information on autrometer, automatic indexing X-ray spectrograph.

73. PUBLICATION LIST—Air Reduction Sales Co. Publications and audio visual list ADG 2057C describes firm's publications and audio visual items available on request. Covers industrial gases, welding and cutting techniques and equipment.

74. HEAT STATION—Induction Heating Corp. Portable heat station used in brazing transformer cooling header and tube assembly is detailed in folder, No. IHN-13.

75. GRINDING—Carborundum Co. "Tool room grinding of alloy, high-speed, and die steels," is a 24-page brochure designed as single source book on grinding for tool room men. Covers 22 areas in field.

76. EYE SHIELD—Welsh Mfg. Co. Bulletin 35 pictures "Cyclops" cushion-soft sided eye shield.

77. AUTOMATIC WELDING—Cayuga Co. Bulletin 5701 describes several welders, including wheel drum.

78. SLING CHAINS—American Chain & Cable Co., Inc. Properties and capabilities of sling chains contained in 4-page bulletin DH-101. Features points to consider when ordering.

79. TITANIUM—Johnston & Funk Titanium Corp. Reference work "Conversion table for titanium wire and rod," provides tables which convert titanium wire diameter sizes to lineal ft per lb.

80. TRACTOR PARTS—Sight Feed Generator Co. 6-page brochure, "Rebuild worn crawler type tractor parts the Rexarc automatic way," is form 757.

81. BOAT WELDING — Ampco Metal, Inc. No. 72 of Ampco Welding News features story on welded propeller shafts which drive shrimp boat fleet.

82. TRACTOR MAINTENANCE—Caterpillar Tractor Co. 24-page maintenance guide pictures helpful hints for getting optimum service life out of equipment, form 32395.

83. ELECTRONICS—Allied Radio Corp. 1958 general catalog, 404 pages with 27,000 items, emphasizes industrial maintenance, research and production requirements.

84. FLUX PROCESSING—Robert Holmes & Bros., Inc. Interested in reducing your welding costs, asks a bulletin on flux processing equipment. Explains salvaging fused flux.

85. PORTABLE CABINET—Simonsen Metal Products Co. Mobile tool cabinet, "Tool Caddy," which carries tools and parts to the job, is detailed in folder.

86. POWER PLANTS—Katolight Corp. Brochure deals with emergency electric power plants, indicating models available and other equipment.

87. SPOT WELDERS—Federal Machine and Welder Co. Illustrated folder describes welders, presses.

88. PROTECTOR—Zippertubing Co. 4-page, 2-color bulletin describes plastic protector for groups of wires, tubes, pipes and hoses; it has zipper closure.

89. VALVES—Hanna Engineering Works. Flo-pilot valves are detailed in catalog 262; includes different models, their features.

90. METALS—Goldsmith Bros. Leaflet describes firm's metals, alloys and chemicals —gives analysis and form.

91. TORCH LIGHTER—Torch Lighter Co. Page lists three lighters for lighting acetylene, natural and artificial gases.

92. SAFETY—National Safety Council. Booklet "Safety slogans . . . from everywhere, for everyone," contains more than 1,000 slogans for safety.

93. OXY-ACETYLENE MACHINE—Indiana Oxygen Co. Bulletin 2M-7-57 portrays machine designed to convey one or more torches for cutting, welding, flame hardening, etc.

94. SAFETY EQUIPMENT—Jackson Products. Form 40 lists arc welding helmets, safety hats and caps, goggles, eyeshields.

95. RADIAC DETECTOR—Chatham Electronics Corp. Illustrated page gives specifications on radiac detector charger XA-100 for pen-type radiacmeters.

96. CONTROL SYSTEMS—Atomic Instrument Co. Industrial counting and control systems described in industrial bulletin, edition II.

97. WET HONE MACHINES—Clementina Ltd. Folder details wet hone machines for cleaning small, critical tolerance parts.

98. LUBRICANT — Harry Miller Corp. Booklet discusses oilless coolant, lubricant and rust preventive.

99. HELMET—Fibre-Metal Products Co. Lift-front helmet No. 668-9 and other models treated in bulletin 47.

100. ELECTRODE HOLDER—Martin Wells, Inc. NWSA index 390 tells of "Tong-grip" electrode holder with six new features.

101. STUD WELDING—KSM Products, Inc. Book covers standard designs and specifications of studs, pins and pads for stud welding.

102. FIRE HOSE—General Pacific Corp. Colorful page pictures and tells of fire hose units shipped completely "packaged."

103. SOLENOID VALVE—Ross Operating Valve Co. Bulletin 311 features direct solenoid operated 4-way valve for air or oil service.

104. GAS GUN—Velocity Power Tool Co. On-off automatic air-acetylene gas gun described in folder.

105. STUD SPECS—Nelson Stud Welding. Catalog includes detailed specifications for firm's studs. Includes information on stud welding.

106. MACHINE TOOLS—Bennett Machinery Co. Pamphlet tells of used and rebuilt machine tools, including radial drills, grinders.

107. SOLVENT—Dow Chemical Co. 16-page booklet gives information on cold-cleaning solvent, Chlorothene.

108. PHOSPHATING—Oakite Products, Inc. Report tells how to phosphate large parts by steam gun application. Solutions clean and coat metal with fine phosphate film that protects against corrosion.

109. INDUSTRIAL EQUIPMENT—Industrial Equipment Co. Catalog lists all types of office equipment including tables, bookcases, cabinets.

110. MILD STEELS—McKay Co. Manual on welding of mild steels includes information on firm's electrodes, specifications, properties, etc., and "quick selection" chart for right electrode.

111. X-RAY TABLES—Philips Electronics, Inc. 86-page book gives X-ray fluorescent spectrometer conversion tables for lithium fluoride, sodium chloride, etc.

112. ELECTRODE—Ampco Metal, Inc. Revised welding catalog W-17 now includes data on 40 electrodes and No. 1, 2 and 3 filler rods. Also technical information on arc welding with bronze electrodes, filler rod and wire.

113. ELECTRONIC RELAY—Arthur S. LaPine and Co. Revised data sheet describes electronic relay designed for safe operation of laboratory water baths.

114. TRIP CONTROLS—Micro Switch. Trip control catalog 65 treats controls and clutch actuating equipment and their installations.

115. ELECTRODE HOLDER—Duro Engineering Co. Catalog sheet describes lightweight and heavy-duty electrode holders.

116. TITANIUM STRIP—American Silver Co., Inc. Data sheet on precision-rolled titanium strip covers physical and chemical characteristics of titanium rolled to thicknesses as low as 0.0005 in. to tolerances as close as plus or minus 0.0001 in. Prepared by firm specialists.

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125. Adjustable Clamp Co.—Write for 32 page catalog on complete line of "Jorgensen" and "Pony" clamps.

126. Aljay Mfg. Co.—Descriptive literature and price information on Aljay's weldor clothing.

127. Allied Welder Corp.—Information on standard welders, welding guns and special equipment problems.

128. Alloy Rods Co.—Complete information on the Wear-O-Matic wires and the Wear-O-Matic wire feed unit.

129. All-State Welding Alloys Co.—New Instruction book on 62 alloys and fluxes.

130. Aluminum Co. of America—Write for booklets and films that show how easy it is to weld, braze and solder aluminum.

131. American Manganese Steel Div.—Information and technical data on "Amsco" tube rods and "MF" semiautomatic welder.

132. Arcair Co.—For proof of performance from many different industries write for copy of Arcair's "Case History Book".

135. Aronson Machine Co.—Detailed engineering data on Aronson positioners.

136. Atlas Welding Accessories, Inc.—Data on complete line of weld-cleaning tools.

137. Bay State Abrasive Products Co.—Write for further information on the right disc-wheel to use for your specific job.

138. Becker Brothers Carbon Co.—Catalog giving complete specifications and scaled drawings of carbon welder brushes.

139. Bernard Welding Equipment Co.—Further information on Bernard's "Short-stub" electrode holders, now equipped with cable splint.

140. Bridgeport Brass Co.—Write for booklet, "Bronze Welding Alloys."

141. Carol Cable Co.—Information on "Dynapower" arc-welding cables.

142. Chicago Hardware Foundry Co.—Information on "Fuse-Well" cast-iron welding rods and electrodes.

143. Columbia Electric Mfg. Co.—Catalog "WE-400" explains Columbia's line of testing equipment.

144. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

145. Crucible Steel Co. of America—Data on "Rexwelded" hardfacing rods for production and maintenance.

146. Cullen-Friestedt Co.—"C-F Positioner Catalog" on low-cost welding.

147. Diamonite Products Mfg. Co.—Write for name and address of distributor in your territory; for Diamonite Welding Cup bulletin; and for information on distributor franchises.

148. Dockson Corp.—Catalog on Dockson's complete welding and cutting outfits, and name of nearest distributor.

149. Drawalloy Corp.—Write for Bulletin 355-DC for complete information on every grade of Drawalloy welding wire.

150. Eastman Kodak Co.—Catalog available on the choice of x-ray films for today's radiographic inspection procedures.

151. Eisler Engineering Co.—Catalog No. 93-57 shows Eisler's complete line of spot and wire butt welders, and also the vertical type press welder.

152. Erico Products, Inc.—Write for further information on the "Caddy" electrode holder.

153. Eutectic Welding Alloys Corp.—Information on the new "Xyron 2-25," the all-position "Frigid-arc" coated electrode for cast iron.

154. Eutectic Welding Alloys Corp.—Copies of the following Eutectic technical digests available: Automotive Welding, Tool & Die, Construction Maintenance Welding and Farm Maintenance Welding.

155. Fibre-Metal Products Co.—Bulletin #55 on new "Superlite" aluminum safety hat and other safety equipment.

156. Foote Mineral Co.—Informative brochure, entitled "Raw Materials For Welding Rod Coatings."

157. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

158. H & M Pipe Beveling Machine Co.—Illustrated bulletins on the "H & M" shape cutter and "out-of-Round" attachment.

159. Harnischfeger Corp.—Bulletin R-29 "P & H Smootharc Welding Electrodes," give full description and specification data of iron-power electrodes.

160. Harnischfeger Corp.—Information on how welding positioners can save time and money.

161. Haynes Stellite Co.—Descriptive literature on the 18 Haynes hard-facing alloys.

162. Hobart Bros. Co.—Complete specifications on the new ac/dc inert gas combination welder.

163. Hobart Bros. Co.—Send for complete electrode catalog, arc welder catalog and Welders' Vest Pocket Guide.

164. Independent Engineering Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

165. International Nickel Co., Inc.—Booklet entitled "Inco Welding Materials" available, explaining how to select and use wires.

166. International Nickel Co., Inc.—Booklet available "Inco Rod "A" gives case histories on problem welds solved with Inco Rod "A" electrodes.

167. Jackson Products—Data on complete line of welding equipment and accessories.

168. Kaiser Aluminum & Chemical Corp.—Write for further information on Kaiser's welding cable made of aluminum.

169. Krembs & Co.—Write for sample of "Fluxines," stating which sample desired.

170. Lenco, Inc.—Write for further information on the new "LW-3" Hi-Amp Holder.

171. Lincoln Electric Co.—Bulletins on any type of arc welding equipment and electrodes are available.

172. Linde Co.—Details on "Unionarc" welding, inert-gas shielded arc welding, submerged arc welding, shielded inert gas metal arc welding and new magnetic flux gas shielded arc welding.

173. Liquid Carbonic Corp.—Complete illustrated literature now available on the Liquidweld family.

174. P. R. Mallory & Co. Inc.—Write for name and address of Mallory distributor serving your area.

175. Manhattan Rubber Div.—Write for bulletin 7157 on the safety back flared cup.

176. Merrill Brothers—Information on lifting clamps, twin and drum lifters, drum tilters and other material-handling devices.

177. Metal & Thermit Corp.—Write for further information on the new high speed electrode "Speedex Triplex."

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page

Also information about

NEW PRODUCTS described on pages 84 to 97

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 84.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

★ Post card not valid after three (3) months. After that time has elapsed, use your own letterhead to describe fully the information and/or literature wanted.

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Company_____

Address_____

City_____ State_____ 12/57

NOT GOOD AFTER MARCH 1, 1958

WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill.

Please send me without obligation further information about the following:

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Welding Info-Aids,
Welding Engineer
P.O. Box 28
Morton Grove, Ill.

Literature offered in ads

(Continued from page 114)

178. Miller Electric Mfg. Co., Inc.—Write for further information on the "Gold Star" electrically controlled welder.

179. National Carbide Co.—Write for name and address of nearest supplier.

180. National Welding Equipment Co.—Write for 44 page brochure on regulators.

181. Nickelson Tool & Die Co., Inc.—Descriptive folder on "Woerner" tubular profile cutter.

182. North American Philips Company Inc.—Informative folder on tungsten electrode welding, also price list and name of nearest distributor.

183. Norton Co.—Details on precisely balanced economy wheels for cutting costs.

184. Page Steel & Wire Div.—Welding rod comparison chart available also folder on "Submerged Arc and Inert Gas Welding Wire" and a booklet on "Gas Welding Rods."

202. J. C. Renfroe & Sons, Inc.—Catalog on complete line of steel lifting clamps.

185. Ruemelin Mfg. Co.—Bulletin No. 37 E explains how to keep plant air clear of welding fumes.

186. Shawinigan Products Corp.—Write for name and address of nearest distributor.

187. A. O. Smith Corp.—Write for further information on the A-C welder, A-C automatic, D-C rectifier and D-C automatic.

188. Stoody Company—The Stoody Guidebook is available covering hardfacing procedures for all types of heavy equipment.

189. Stulz-Sickles Co.—Write for further details on how to rebuild worn Tractor Grousers and for name and address of nearest distributor.

190. Superior Air Products Co.—Catalog available on producing your own liquid oxygen.

191. Taylor-Winfield Corp.—Send for details on how a custom-built projection welder can perform versatile assembly work, thereby reducing costs.

192. Tempil Corp.—Information on, and samples of, pellets (state temperatures of interest) of temperature indication materials for all heat-dependent operations.

193. Tennessee Fabricating Co.—32-page catalog lists "Everything for the Ornamental Iron Shop."

194. Titanium Alloy Mfg. Div.—Detailed literature on advantage of "Ruflux" electrode coatings.

195. Tweco Products, Inc.—Catalog picturing complete line of Arc Welding Accessories and Tweco-Lite aluminum arc welding cable.

196. United States Steel Corp.—Write for complete information about the application and fabrication of USS "T-1" Steel.

197. United Wire and Supply Corp.—Details on how you can profit from automated brazing with "Phoson 6."

198. Vickers Electric Div.—Complete information on "Control-arc" and other high-quality high-performance welding machines under development.

199. Victor Equipment Co.—Cutting Tips Bulletin 214 helps you select the right tip for your job.

203. Victor Equipment Co.—Hardfacing Manual shows you right rod to use and how to apply it.

200. Welsh Mfg. Co.—Write for further information on Welsh's cushion-soft frames for comfort-fit eye protection.

201. Worthington Corp.—Information on Worthington's line of positioners, automatic welding head manipulators, turning rolls and head and tailstocks.

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Company_____

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City_____ State_____ 12/57

NOT GOOD AFTER MARCH 1, 1958

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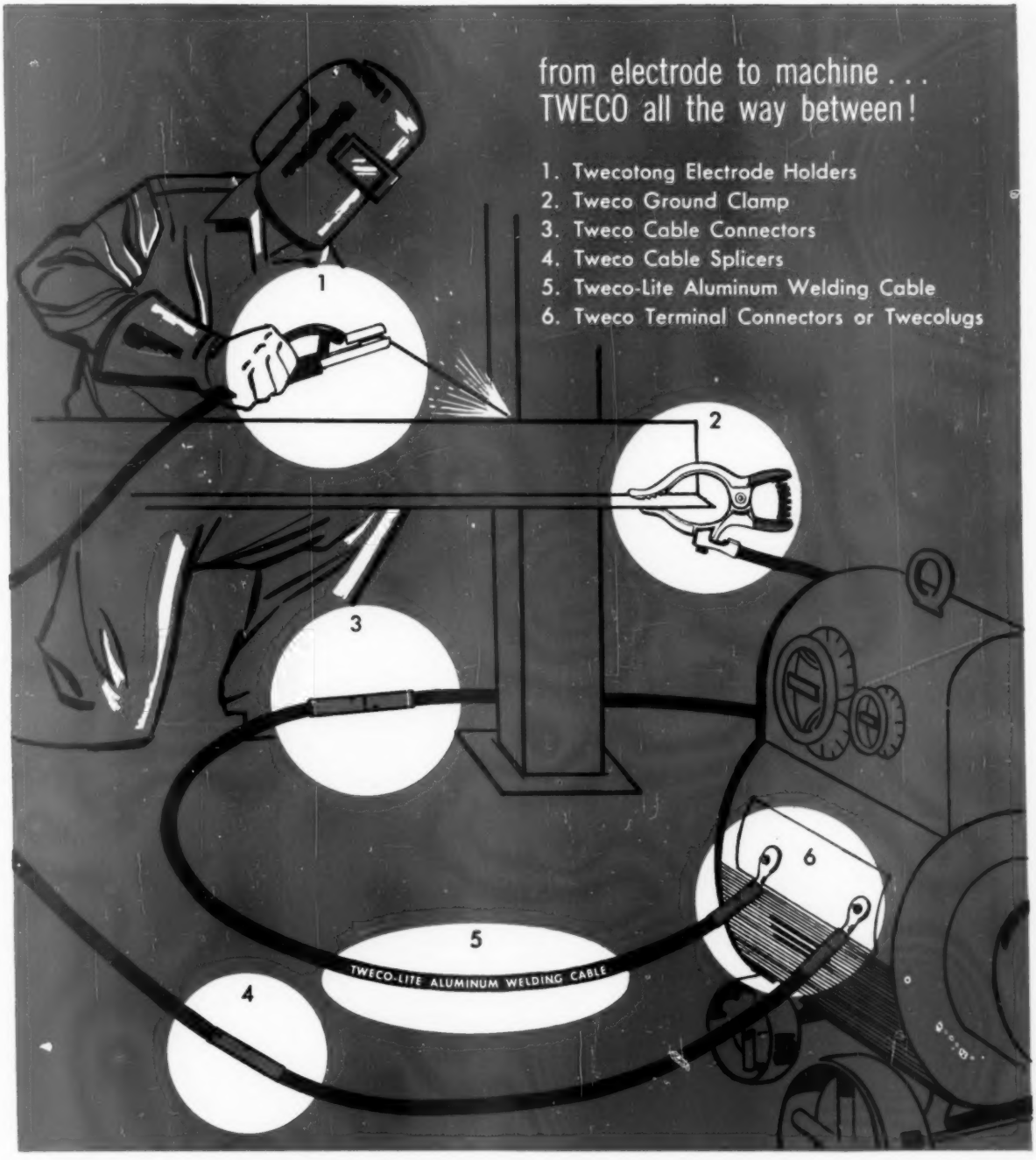


SEE YOUR LOCAL WELDING SUPPLY DISTRIBUTOR

Write for FREE Catalog picturing complete line of Arc Welding Accessories and TWECO-LITE Aluminum Arc Welding Cable

Tweco

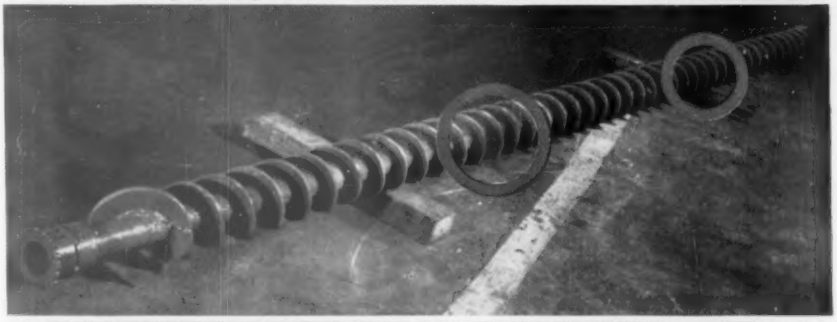
MANUFACTURERS: ARC WELDING ELECTRODE HOLDERS, GROUND CLAMPS, CABLE CONNECTORS, TWECO-LITE ALUMINUM WELDING CABLE

PRODUCTS, INC.

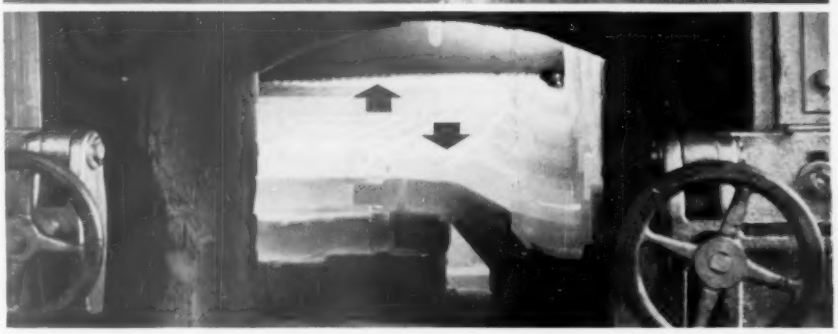
BOSTON AT MOSLEY • WICHITA, KANSAS, U.S.A.

Inco Rod "A" electrode triples life of problem joint...

in heat resistant alloy screw conveyor...



subject to 1725°F to 1800°F temperatures.



Now—one electrode . . . Inco Rod "A" handles most problem joints

...welds most dissimilar alloys as well

Lap welded joints in the Duraloy screw conveyor (above) never used to last more than four months.

Cyclical heating and cooling caused the welds to crack and break.

Engineers at The Chicago Heights plant of Alco Products Inc. decided to try Inco Rod "A"* electrode. Today they report these welds are still going strong after a *year's service.* No preheat is used. And the entire welding job takes only three hours.

If you want strong, sound, ductile welds in problem joints try Inco Rod "A" electrode. No special equipment or training is needed.

You can also use this versatile Inco electrode to get X-ray quality welds between many dissimilar alloys ...between ferritic and austenitic stainless steels...between low alloy and mild steels...between high-nickel and other alloys.

Helpful booklet—"Inco Rod 'A'"—Free!

Contents include case histories on problem welds solved with Inco Rod "A" electrode and results from test data compiled on 23 dissimilar alloy combinations. Send for your copy today.

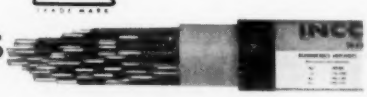
*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO

INCO WELDING PRODUCTS



ELECTRODES • WIRES • FLUXES